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ABSTRACT

The paper reviews international research on computer assisted learning (CAL) for special populations and examines the issue in terms of the Canadian policy perspective. Data collection techniques included interviews and field observations with researchers, manufacturers, and policy makers. A generic model is proposed for special education computer applications. A review of research is followed by summary and evaluation of published and unpublished courseware. The potential courseware and related hardware developments based on the generic model are discussed. A concluding chapter proposes a national policy in terms of a federal/provincial governing board, a national dissemination and information network, and national and regional ongoing committees and task forces. A bibliography is followed by extensive appendixes which supply related information on resources, software, software and hardware companies, evaluation and information sources, and correspondence. (CL)

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AN OVERVIEW AND PLAN FOR THE CANADIAN IMPLEMENTATION OF COMPUTER ASSISTED LEARNING COURSEWARE FOR SPECIAL NEEDS CHILDREN, ADOLESCENTS AND ADULTS

SUBMITTED TO

THE FEDERAL DEPARTMENT OF COMMUNICATIONS
UNDER THE UNIVERSITY RESEARCH GRANTS PROGRAM

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ABSTRACT

This study "An Overview and Plan for the Canadian Implementation of Computer Assisted Learning Courseware for Special Needs Children, Adolescents and Adults", was undertaken on behalf of the Department of Communications, Government of Canada, Ottawa, under the University Research Grants programme. The research was coordinated by Dr. Lauran Sandals from the Department of Educational Psychology, University of Manitoba, with the assistance of two graduate assistants, Ms. Georgina Falzarano and Ms. Janet Sirrell, and was carried out in order to collect information and interview individuals for this final report. This report presents 1) the past research in the area of Computer Assisted Learning for Special Needs Individuals Worldwide, 2) the present research and progress developing Computer Assisted Learning Materials for Special Needs Individuals, and 3) a proposal for future research and curriculum development in the area of Computer Assisted Learning for Special Needs Individuals from the Canadian perspective; and a nation-wide implementation policy for future Federal and Provincial funding in this area.

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CHAPTER ONE

INTRODUCTION

It has been said that the 21st century is to be Canadas' from both a political as well as an economic perspective. If this is to become a reality rather than just some unfulfilled high expectation, it will take a committment by both our Federal and Provincial governments working in cooperation to make Canada the world leader in the information based technologies of the future. High-Tech has become a household word for the young and old alike. This is illustrated by new design forms in furniture; to the growth of new industries founded on the micro chip board technologies from satellites, and their related hardware; to telecommunication based networks. The potential for these high priced pieces of hardware is still limited until a piece of software is created that allows the hardware to be used to its maximum potential. This software creation, depending on the respective application, can sometimes cost 3 to 4 times the investment cost of the hardware and its related peripherals. From an economic perspective, this software development has always been viewed as an added-on cost, when in fact it should be planned for in the development of any new technological application. In the field of education, this need for software creation and courseware has to be addressed at a national as well as a provincial level if we are to have control over the majority of electronic publishing materials. Such materials are now being imported in ever increasing numbers to the point where some provinces in Canada are using American based courseware for 95% of their present classroom needs. Furthermore, there are many reasons why and how this software has been produced outside of this country, but this will be discussed in greater detail in later sections of this report.

In the same period of time over the past 15 years that has shown such great growth in the technology area, we have also seen an even more rapid appreciation and knowledge base in the area of education and rehabilitation of special needs individuals. This change in attitude has been led by professionals in the areas of health and education, as well as through the support of politicians at the municipal, provincial and federal levels. Additionally, special needs individuals, as well as their parents and relatives became active as lobbyists at all levels of society that could have an effect on their growth as human beings. This new awareness and integration of the special needs individual into the mainstream of society has brought us to this point in time where we can use the technologies which we have developed for industry and science for the betterment of society, and principally the special needs individual. These developments in the past decade have included such things as electronic wheelchairs, sophisticated prosthetics, readers for the blind such as the Optacon and Kurzwell reader; and more recently single switch devices integrated with scanners that allow the special needs individual to control his or her living and work environment.

OVERVIEW

The uses of the computer in education have changed markedly over the past twelve years. We have gone from experimental applications in small studies to wide-spread applications in almost every western country. The most important limits which inhibited further use were: 1) the continuing high start-up costs involved in large system computer hardware; 2) a lack of high quality software and courseware for educational applications; and 3) a lack of a computer-literate body of teachers and administrators to make important decisions regarding this new technology.

Because of recent remarkable growth in the area of micro-electronics, the problem of high computer terminal and hardware costs has been eliminated for many computer applications in education not requiring large data bases and files (and this last limit will (probably) be removed in the next five years). There is now a concentrated effort on the part of many school boards and provincial, state and federal governments to create consortiums of users in order to create, exchange, and adapt existing software in the area of the educational uses of computers. Private industry is also becoming aware of the potential market for high quality courseware. With the growth of personal and hobby microcomputers, calculators, and microprocessor-based games and toys, parents as well as teachers and administrators are becoming aware of the potential of the computer both at home and at work. This new awareness has impacted everyone's daily vocabulary. We see advertisements for products with digital this and micro that, computer quartz timing, etc. The fear that computers may replace teachers, administrators, and educational

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support staff has been alleviated by this new awareness. Teachers and administrators now request credit and non-credit courses in faculties of education, community colleges and technical institutions. The potential for computer applications in education is now growing extremely rapidly; so fast that microcomputers are now being ordered by many school divisions in the same way that science or language arts order other school equipment and supplies.

Most past research in Computer Assisted Learning (CAL), however, has been with that part of the population who are mentally and physically normal children and adults. These studies have been in universities and in public elementary and secondary schools. In comparison, little attention previous to 1980 was paid to the development of CAL as a useful means of giving instruction to the handicapped and children, adolescents and adults with special needs.

One of the real practical uses of computer instruction is with the mentally and physically non-normal portion of the population as well as those with learning problems and special needs, who require the extra guidance and remediation or enrichment and advancement which a CAL

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environment can give.

The computer provides vast storage capacity, intricate remediation procedures and high motivational stimuli. Together, these give the special learner a more adequate chance of acquiring academic and social skill knowledge on a scale that was not long ago considered to be unrealistic.

The advantages of computers as an instructional tool for children, adolescents and adults who have learning problems were addressed in the 1970's in papers by Kutson and Prochnow (1972), Sandals (1973), Hallworth et al. (1974), Hill (1976), Fiorentino (1977), Reeves (1978), Bakken (1979), Sandals et al. (1977). Also, considerations for implementation of CAL with children and adolescents with handicaps and learning problems have been discussed by Sandals (1975).

With the recent development of the microcomputer in 1978 and the international acceptance of its potential in 1980, there are now a tremendous number of applications being made available to special needs individuals worldwide. Many of these applications have been in the area of the education and training of the special needs individual.

In Canada, most of the leaders in this area have been actively involved in reporting and trying to disseminate their results and the perceived future needs of special needs individuals. In British Columbia, Dickinson and Conway (1982) have reported on a microcomputer application for improving the speech of the hearing impaired while Dumper (1983) has been adapting microcomputers for the physically handicapped. In Alberta, Hallworth, Brebner et al. (1980) have been carrying out research with the developmentally handicapped while the Alberta Department of Education has produced two reports - one by Wilson (1984) reviewing computer assisted instruction for special education, and another by the Alberta Dept. of Advanced Education for CAL with the physically handicapped . In Saskatchewan, Colburn (1982) has been carrying out work in the area of assessment, while Zimmer has been involved in applying Telidon technology in the sheltered workshop setting. In Manitoba, Sandals (1980 a&b, 1982) has been involved in coordinating an intergovernmental consortium providing computer courseware for special education applications, as well as the regular school program for the past 11 years. In Ontario, Nelson et al. (1982) have been working at the National Research Council of Canada in the Medical Rehabilitation Research Department making microcomputers available for the physically handicapped. Others such as Parnes et al. (1983) and McNaughton et al. (1982)have been carrying out their research in the area of augmentive commununicative services and blissymbolics at the Onatrio Crippled Childrens' Center. The Ontario government is providing 10 million dollars over the next 2 years for courseware development, with 1 million dollars of these funds targeted for special education applications. In Quebec, recent research in this area has been carried out by Goulick et al. (1983) in both schools and hospital settings. Thus in Canada, we do have some world leaders in this area, but we have no federal or provincial policies which allow us to cooperate and share ideas and resources which makes us more and more vulnerable to those countries such as Britain, France, U.S.A., New Zealand and Australia which not only have more established national policies in education, but also now in computer applications to education and training even in the area of special needs individuals.

In Britain, there is a national microcomputer in educational policy, and 14 resource and research centers have been set up, four of which are designated as special

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education research and resource centers. These centers operate on a twelve million dollar per annum budget, and some of the research policies in special education are outlined in Dyke (1983) and Richards, C. (1983).

In France, there is also a general national policy in the development of microcomputers in education, with extra resources going into the special education area as reported by Dubreuil (1984). In the U.S.A., there has been a tremendous rush of federal and state dollars in the area of microcomputers of education and rehabilitation applications. These have been reported in Tabers' (1983) book on "Microcomputers in Special Education", Goldenbergs' (1979) text "Special Technology for Special Children" and the resource guide by Nave, Browning and Carter (1983) "Computer Technology for the Handicapped in Special Education and Rehabilitation: A Resource Guide", outlined and abstracted in Appendix A. In such states as Florida, major projects are being funded to carry out the evaluation of hardware and courseware for computer assisted learning for special needs individuals. In the Tampa area, this is being carried out at Project CASH by Sloane in Miami at the Florida Diagnostic and Learning Resources Sytem-South. In the State of Wisconsin, a major research center has been established at the University of Wisconsin called The TRACE Center, researching many of the major issues in this area, and is coordinated by Vandereiden et al (1983).

Major courseware reviews are being undertaken by such organizations as the Council For Exceptional Children and LINC, and are printed in a publication called the Special Ware Directory (1983) which is abstracted and outlined in Appendix C. In the past year two major international conferences were held in this area in the states - one entitled "Computers For the Disabled" - co-sponsored by CLOSING THE GAP and the University of Wisconsin. Stout in Minneapolis, Minnesota, and an abstracted overview of the conference can be found in Appendix B. Some states in the U.S.A., such as Connecticut, have set up at the University of Connecticut, a major R and D center, with theirs being entitled "The Connecticut Special Education Network for Software Evaluation". And finally, a major electronic network in the states called SPECIAL NET has been set up by the federal government as one of its many heavily funded research and development projects on technology in education. SPECIAL NET is a national special education computer assisted telecommunications network which provides to 50 states 21 information data bases which include special education programmatic, technology, and management areas, with up-to-the-minute resources from experts in those fields.

In Australia, research has been reported by Lally (1980) and in New Zealand by Ryba (1980, 1982). These two countries have been actively involved in the federal funding of research in the development of computers in education for a number of years, and more recently in the area of special education and training. In fact New Zealand has federally funded the development of their own educational microcomputer called the POLY which has incorporated features for the special needs individual.

It can be seen by the aforementioned review of research in other countries that research and development projects are being carried out in most of the major western countries in the area of computer assisted applications for learning and training with special needs individuals. The funding for these projects has occurred at the federal level. In Canada we have had to fund disjointed research in this area from local and provincial funds with no coordinated national effort and it is not that the federal

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and provincial governments cannot get together on high technology applications programs, considering that they recently made a major announcement by Donald Johnston, Minister of State for Science and Technology:

> "The Federal Government has launched a major new spending drive to encourage research partnerships between universities and industry...$16.5 million will go to the national science research council (NSERC) over the next three years to expand its programs to promote university-industry cooperation. Another $17.4 million will be added to NSERC's 1983-1984 budget to strengthen it university research and manpower training programs. And finally, a total of $19.5 million will be spent over the next three years on a Canadian microelectronics corporation, a new body set up by universities, industry and government to oversee a national microelectronics design network." (University Affairs, March 1984)

If the Canadian government, along with the provinces, can fund over the next three years $53.5 million on a national microelectronics design network, it should be able to consider a national policy for Computer Assisted Learning Courseware For Special Needs Children, Adolescents and Adults.

METHODOLOGY

The methodology for this study consisted of the following data collection techniques which are presented in this Final Report as a review, survey and proposed Program and Research guidelines for a national implementation.

Because the field of computers in general is growing so rapidly, and specifically Computer Assisted Learning, we depended upon personal contacts and field observations to remain abreast of the state of the art of computers, Computer Assisted Learning, and Courseware Development for Special Needs Individuals. Thus Method Sections three through to eight necessitated travel, and telephoning in order to interview and evaluate the most up-to-date research in the field. A list of replies and information provided regarding points 1-12 below appears in Appendix of this report.

1) A review worldwide of past and present published research and studies on the applications of Computer Assisted Learning For Special Needs Individuals.

2) A review worldwide of past and present studies reported in conference proceedings, workshops and other popular media regarding CAL with Special Needs Individuals.

3) Interviews, field observations and correspondence with researchers in Canada who are involved in research for CAL with Special Needs Individuals regarding their past, present and future research activities.

4) Interviews and correspondence with members (Special

Education and Computer Consultants, Deputy Ministers) in provincial Departments of Education and Health and Welfare regarding their positions and goals for Special Needs Individuals, and the populations in their provinces which benefit from such courseware proposals. Interviews and discussions were carried out with the cooperation of the Council of Ministers and Provincial Ministers. Further interviews occured with provinces that demonstrated an interest in courseware development for Special Needs Individuals.

5) Interviews, field observations and correspondence with researchers in the U.S.A., Australia and New Zealand (within context as part of a Research Study Leave in 1979 and 1983) who are involved in research for CAL with Special Needs Individuals regarding their past, present and future research activities.

6) Follow-up interviews, field observations and correspondence (visited in Feb., 1983, as part of Research Study leave) with British, French and Dutch researchers who are involved in research for CAL and CAL with Special Needs Individuals, regarding their past, present and future research activities.

7) Interviews, field observations (when necessary) and

correspondence with hardware manufacturers regarding their present and future plans for Computer Assisted Learning in general and specifically special hardware or software for Special Needs Individuals.

8) Interviews, field observations (when necessary) and correspondence with software manufacturers and publishers regarding their present and future plans for Computer Assisted Learning courseware in general, and specifically for Special Needs Individuals.

9) An overview (content and format) of published and unpublished evaluations of the presently available computer software and courseware for Special Needs Individuals using several of the educational software evaluation instruments.

10) An analysis of the curriculum areas covered by the presently available software either in Public Domain or by purchase or lease, and an elaboration on where curriculum needs are either being met poorly, or not at all.

> Methodology Sections 11 and 12 are presenting goals and objectives for curriculum areas in both academic and social/survival skills for Special Needs Individuals. This report presents outlines and examples where needed of possible curriculum topics for courseware development but the writing and development of the curriculum would be an outgrowth of this report.

11) A presentation of proposed curriculum goals and objectives at the elementary, secondary and post-secondary level for Special Needs Individuals using Computer Assisted Learning courseware as an adjunctive and mainline instructional support.

12) The presentation of a realistic proposal for both Federal and Provincial governments, for a national program and initiatives for research and development of Computer Assisted Learning courseware materials for Special Needs Individuals.

MODELS

In order to organize and synthesize ideas, information and recommendations, it is sometimes useful to use a generic graphical model which will tend to put information in such a varied field of applications as this one into a better perspective for the reader. The only published generic model which this research has been able to find appears in Figure 1 and was presented by Nave, Browning and Carter (1983) in their text "COMPUTER TECHNOLOGY FOR THE HANDICAPPED IN SPECIAL EDUCATION AND REHABILITATION: A RESOURCE GUIDE". These researchers make a valuable commentary on the advantages of using their model which follows:

> "A generic model representing some of the major areas using personal microcomputers as a benefit to special education and rehabilitation is presented in Figure 1. The model includes both physical and developmental handicaps on one dimension, and categorizes applications into education and rehabilitation along the other dimension. This framework is general and thus does not delineate the full range of fundamental computer usages. For example, Watts (1981) has identified 12 specific applications of microcomputers in education, and Vanderheiden (1981) speaks to the same number of uses in rehabilitation. The model, however, serves to introduce the reader to the major thrusts of work published in this area and included in the guide. The subject index is intended to assist the reader in locating the literature which relates to the model domains." See Appendix for an abstraction and outline of Nave's guide.

The Nave model is very useful; however, this researcher felt that it was a bit limited when discussing the objectives and methodology of this report. Thus Sandals has presented the generic model in Figure 2 in order to clarify the outline of this research report and national plan. While Nave's model is two dimensional, the Sandals model is three dimensional and tries to reflect the three major issues when organizing educationally related courseware for the special needs individuals. In Figure 2, Factor A represents the degree of the special need of the

Figure #1

NAVE, 1983

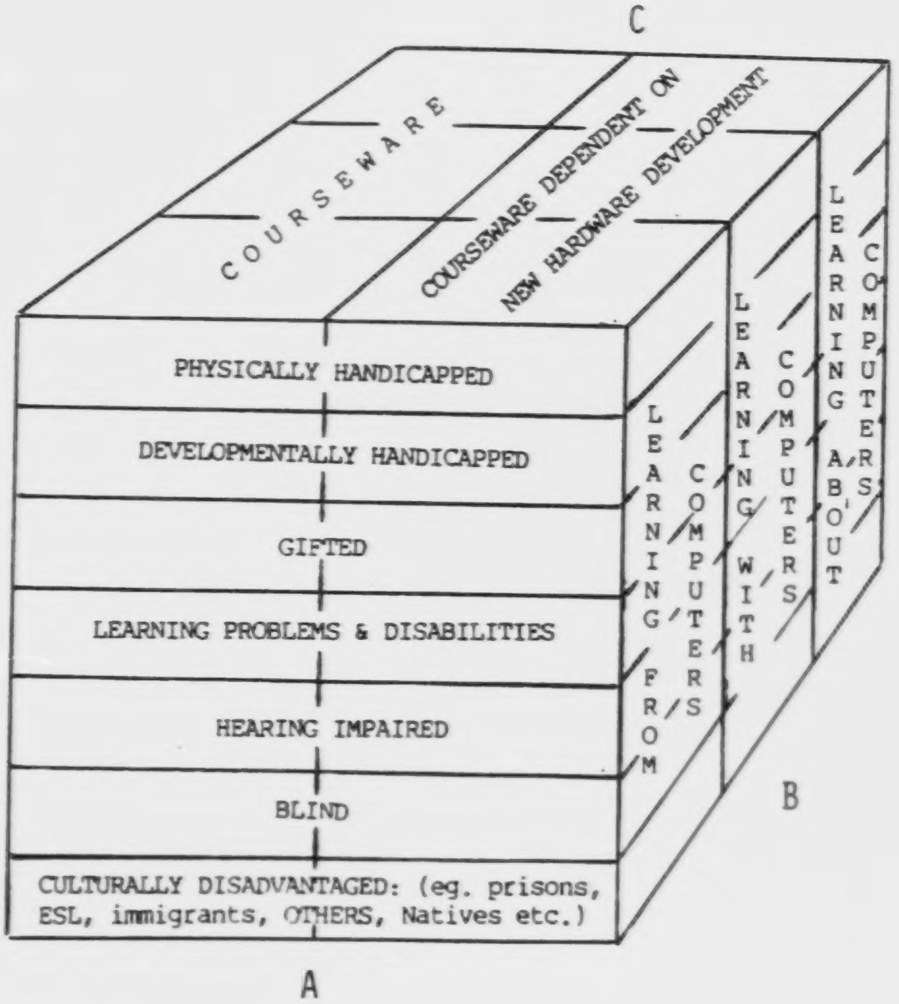
from

"COMPUTER TECHNOLOGY FOR THE HANDICAPPED
IN SPECIAL EDUCATION AND REHABILITATION:
A RESOURCE GUIDE"

	Education			Rehabilitation		
	Instruction		Management		Functional Aids	
	Student/ Client	Teacher/Service Provider	▨	▨	Communication	Independent Living
Physical Disability						
Developmental Disability						

Figure #2

SANDALS' GENERIC MODEL FOR COMPUTER
APPLICATIONS FOR TEACHING AND TRAINING WITH
SPECIAL NEEDS INDIVIDUALS


C
COURSEWARE
COURSEWARE DEPENDENT ON NEW HARDWARE DEVELOPMENT
PHYSICALLY HANDICAPPED
DEVELOPMENTALLY HANDICAPPED
GIFTED
LEARNING PROBLEMS & DISABILITIES
HEARING IMPAIRED
BLIND
CULTURALLY DISADVANTAGED: (eg. prisons, ESL, immigrants, OTHERS, Natives etc.)
LEARNING FROM COMPUTERS
LEARNING WITH COMPUTERS
LEARNING ABOUT COMPUTERS
B
A

individual and although it is categorical in nature which is against the philosophical thrust in the mainstreaming of the special needs individual in our schools and society, it is felt that it will help in the organization and the priorization of needs presented in this report. Factor B represents the different levels of computer applications to education and also training that is currently considered instructional in nature, which has been discussed in more detail by Arthur Luehrmann (1981). LEARNING FROM COMPUTERS is the classical use of computers for Computer Assisted Instruction (CAI) or Computer Assisted Learning (CAL), namely, Drill and Practice, Tutorial, and Simulation modes. LEARNING WITH COMPUTERS is the use of computers as an extension of the individual similar to the pencil, pen or paint brush. Examples of this mode is the use of the computer in music and art education as well as interactive design languages such as LOGO and KIDSTUFF. LEARNING ABOUT COMPUTERS refers to the awareness, literacy and career aspects of having a knowledge of computers to use in a high technology related job or just for self-growth. Factor C defines the two ways courseware can be used in relationship to Factors A and B, namely, educational courseware that can run on standard off-the-shelf computer hardware that would be considered a normal configuration for instruction and training. The other level refers to courseware that is dependent on extra hardware requirements and configurations that are necessary for Special Needs Individuals. These include firmware cards, and single switch devices, plus extra multi-media input-output units like the random access video and slides, synthetic and digital speech devices and voice input devices (such as the shadow vet and touch devices, i.e. koala and power pads).

SUMMARY

In conclusion, the Sandals' model in Figure 2 represents a conceptual organization in which the context of the next chapters of this report have been presented. Chapter 2 will be presenting a complete overview of past and present research studies related to computers for Special Needs Individuals. Chapter 3 presents a summary and evaluation of published and unpublished courseware that is available in this area. Chapter 4 presents a synthesis of the information presented in Chapters 2 and 3 and recommends the curriculum areas that must be addressed in any major national initiative in the research and development of courseware for Special Needs Individuals. Lastly in Chapter 5, there is a complete presentation and plan for the Canadian implementation by the Federal and Provincial governments of Computer Assisted Learning Courseware For Special Needs Children, Adolescents and Adults.

CHAPTER TWO

REVIEW OF RESEARCH

The enormous amount of development in the field of microcomputers and adjunct controls and systems makes any review obsolete as it is written. In fact, one use of the computer can be to act as a disseminator of information on new developments in technology as they become available. However, a review of research can distinguish certain trends and isolate areas where microcomputers may be deemed to be particularly effective or ineffective, and appropriate and inappropriate in the field of Special Education.

A study of the available research indicates that microcomputers are now being used in many diverse ways; from administrative duties, through communications, teacher training, pupil diagnosis, instruction, remediation, testing, vocational training and counseling, and prosthetic applications which attempt to compensate for disabilities. This review will, therefore, be divided according to the application of available technology, and further subdivided, where appropriate, into applications associated with specific exceptionalities. It is relevant to alsopoint out that any one microcomputer will in many cases function in more than one area simultaneously.

ADMINISTRATIVE APPLICATIONS

Apart from the routine clerical/budgeting duties associated with the operation of any education service, in Special Education computers can be used to track and manage referral, testing and staffing information; generate reports to comply with government regulations; retrieve materials and resource information; manage instructional programming and generate Individualized Education Programs (I.E.P.) (Brown, 1982).

Large data base systems can exist on a centralized computer system which can be accessed for input and output functions through individual microcomputers in the schools (Killen & Myklebust, 1980). Data bases can provide information on such topics as 1) Educational goals and objectives, 2) methodological advances, 3) instructional methods which interact with specific goals and objectives – e.g. recommended materials and their availability and location, (Wilson, 1981) and also teaching competency information and supportive information (Lehrer & Daiker, 1978).

Information thus stored can be used to assess educational practices and evaluate success (Killen, 1980). MONITOR – a computer based management information system for special education was designed to 1. assign and monitor time lines for all educational services to be delivered to special education students, 2. provide time line summaries of educational services delivered and yet to be delivered, 3. provide program information on the ability of special schools to deliver educational services within established time lines, and 4. provide student records to program administrators. (Whitney, R.A. & Hofmeister, A.M., n.d.).

An important aspect of special education is the provision of individualized programming. This is another area in which the computer can be used to assist the teacher/administrator both in the formation of I.E.P.s, and in the monitoring and record keeping aspects. In the formation of an I.E.P., computer management systems can quickly provide teachers with information on teaching techniques and instructional materials appropriate to specified student needs, identify the location of the material, and also designate other students for which the material may be useful (Samuels, M. & Minick, B., 1980). In this type of program individual student needs are matched with resources.

Another method is to match instructional/ behavioural objectives to resources and techniques as is used in such systems as HELPS (Lehrer & Daiker, 1978) and CAMEO (Brown, 1982).

Advantages of using a computer based interactive management system are said to be that it enhances decision-making and increases awareness of available materials (Lehrer & Brown, 1978). They can also provide feedback on students responses to teaching and improve teacher consistency by giving feedback of staff/student performance (Schnitker & Bocker, 1978). A computer managed

I.E.P. also provides a continuous record of student activity and thus cuts down on time spent on clerical duties by the teacher.

COMMUNICATIONS - PROSTHETIC USE

In the educational process, the ability to communicate is essential. Pupils must be able to make known their needs, responses and creative thoughts while teachers must be able to interact with the child if learning is to take place. Many of the causes of communication impairment are due to physical disability and in no way reflect a reduction in linguistic potential and cognitive reasoning. While specific communication devices have been available for some time (Foulds and Bennet, 1982), they were expensive and not readily available. The advent of the microcomputer, especially the hand-held/battery powered variety, holds great potential to be able to perform this function, as well as many others for the child. It is also readily available in most towns (Foulds, 1982).

The computer may be interfaced with a speech synthesizer, or a printer, and accessed through a variety of input devices selected and customized for the individual child. Many possible input devices are possible from traditional keyboard, joystick, single switch (operated by any muscular movement, line of gaze, experimental implantation, or surface switches) (Rahimi & Thomas, 1981 and others).

While successes have been noted (Schaeffer, 1983; Scully, T. 1978), problems exist in that microcomputers are large in the context of easy mobility by a dissabled person (Demarco & Foulds, 1982), and communication is usually slow and very hard work for a disabled child (Baker & Foulds, 1982). The first problem is a matter for technological development and is already being solved by the hand-held computer (Demasco & Foulds, 1982). The second problem requires a more radical consideration of semantics. Many of the systems available today involve techniques such as scanning the alphabet or phonemes or word selections, with the input device functioning to stop the cursor at the appropriate user selection (Sculley, 1978 and Foulds, 1982 et al). Apart from the time it takes for the computer to scan the menu option selected, it may take

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a neurologically impaired person 5 seconds of intense effort to make a selection. Normal response time in conversation is less than 3 seconds; more than 10 seconds causes anxiety (Baker, 1982). So it can be seen that the speed of response may cause impatience in the listener. A new approach is being tried with such systems as Minspeak where certain phatic phrases such as "Am I right, Joe?" are coded for single key input. The selection board deals with concepts, related sentences, and phrases, etc., appropriate for that concept, which are then made available. Keyboards, (Baker, 1982) which may be graphic or alphabetic and graphic design, are other alternatives which allow the user to choose sentences, or even whole stories, with a 1 or 2 key punch input (Ruchakoff & Lombardino, 1983). As Foulds (1982) states, most systems at present underutilize the capability of the computer, and systems can be developed where the computer can predict the next letter/phoneme/sound (Foulds & Balesta, 1975), (Goodenough, Trepagier et al, 1981) or provide keys which will change root words to the future, past, or plural tense and with a single keystroke (Rahim, 1981). These devices are available to be connected to speech synthesizers or printers or display terminals. Communication in schools may often be through written language, and here the time element may not be as big a drawback.

These communications devices can also communicate via another computer through such adaptations as the MOD keyboard (Nelson, P., 1983) which opens the curriculum of regular courseware and software to the disabled child.

The Ontario Crippled Children's Centre and the Blissymbolics Communication Institute have worked with individuals using a Blissymbols board as the input device. An Apple II computer, with its graphics capability and speech synthesizer, or printer, provided the system. This allowed children to become relatively independent: the computer acted as translator, negating the need for a human translator. Certain word processing type options are also available for the Blissapple user (Lee, 1982; Parnes & Lee, 1982). Additionally, the computer was used to train the children in onthographic communication simultaneously.

> "The ultimate prosthetic computer for the physically handicapped person would be installed in the person's wheelchair as part of that person's property. It must be free of wire so that the person's mobility is not limited and it must be capable of at least text manipulation and

> graphics. Depending on the needs of the individual it may also have to control the movements of the wheelchair and speak out loud to enable the person to talk to others or to use the telephone. The research needed here is primarily in human factors and mechanical engineering, since the electronics of a device of the right power and size is essentially already available." (Goldenberg, P., 1979).

Communications on a scale larger than one-to-one can also be facilitated by computers using systems such as "Deafnet", which is a computer based network which links the deaf with other deaf people, hearing friends, schools or businesses. It allows for the immediate transfer of "conversations" or acts as an answering service where messages can be left (Session S-18-Leader - Tenesa Middleton - Reno Conference).

TEACHER TRAINING

In the U.S. P.L. 94-142 states that teachers of exceptional children must be appropriately and adequately trained. Much of this may take the form of inservice. Ogletree and Atkinson (1982) in a survey of 112 Chicago teachers who taught mainstreamed exceptional children, found that the majority felt the need for inservice training. Carpenter (1979) gives 3 reasons for the current demand: 1. rapidly expanding amount of new information, techniques and materials available, 2. decreasing employment opportunities for new teachers resulting in a slower inculcation of improved approaches, and 3. increases in classroom heterogeneousness.

As an alternative or an adjunct to traditional inservice practices modern technology offers inservice training through closed circuit interactive television (Carpenter, R., 1979) or computerized individual instruction (Lake, T. 1974); (Cartwright, P. & Cartwright, C.,1974).

Computer simulations are also used in the training of graduate students. Lerner & Schuyler (1974) describe simulation as a bridge between theory courses in diagnosis and actual clinical experience. Farell (1979) found that C.A.I. trained students scored as well as practicum trained students in measures of diagnostic accuracy, confidence and attitude. Decision making skills can also be taught using C.A.I. (Bessent, 1974). CATTS is a computer assisted teacher training system which assesses and develops interactive teaching skills (Semmel, 1976). Advantages are said to be immediate feedback and storage and retrieval of previous training sessions. Semmel (1981) also describes a behaviour management simulation training system. Cartwright and Cartwright (1974) describe the CARE teacher training system which is a C.A.I. program to develop greater skills of diagnostic teaching in Early Childhood Education. This program is now available on Apple IIe and the TRS-80 Model III. This keyboard is used in 5 North American courses for special education teacher and professional training. Hofmeister & Thorkildsen (1981) suggest that the combination of computer and videodisc will play an increased role in the training of Special Education teachers.

Thus it can be seen that an interactive computer program may be one option for training teachers for Special Education or regular classroom teachers who deal with mainstreamed children. It is cost effective in that one training program may serve many trainees in different places at different times. Travel time and money is also reduced.

DIAGNOSIS AND TESTING

Computers can be used in various ways in the testing or diagnosing of children. They can be used to generate randomized tests from large pools of question and answer selections - producing a large number of unique but equivalent tests administered either on-line or by conventional paper and pencil methods. They can also generate batch copies in advance to be administered by paper and pencil (Dunkleberger, G. & Heikkinen, H., 1982). Large data pools are necessary and while it is costly to establish this method of test generation dramatically reduces clerical demands.

Tests are also available at any time. When tests are administered on-line, evaluation can be immediate, and in a system such as TIPS at the University of Wisconsin, 3 different reports are generated: one to the student containing his/her answers, number of correct responses, and an assignment; the second goes to the T.A. which gives a similar report and a list of all students needing help; the third list goes to the professor containing pooled information on all students (Dukleberger, G. & Heikkinen, H. 1982). Tests answered on cards can be scanned, with similar reports given out as mentioned previously. Dunkleberger & Heikkinen state that this type of test frees the teacher for teaching, and suggest that computers could be programmed to use the results of the testing process and other factors to structure and define individual learning. Telden, D. suggests that computer-assisted evaluation is based on the premise that education is individual, and thus individual tests specific for each student can be generated. This idea is further developed by McKinley, R.and Rechase, M. (1980) who suggest that tests can be geared (by the computer) to the individual level of the student so that all tests will fall into the area of most reliability, i.e. not fixed at the extremes of ability. They also point out that computer generated testing eliminates time pressures, test security and differences in test administration.

Computers can be programmed to evaluate and analyze specifics. Some examples are Assessing Skilled Functioning of Mentally Retarded Persons (Crawford, J. & others, 1980); analyzing written language structure of deaf children (or others) (Parkhurst, B. & MacEachran, M., 1980); diagnosing spelling problems in L.D. students (Hasselbring, T. & Crossland, C.L., 1981); Classification of Developmental

Learning and other disorders (McDermott, P. 1980); Behaviour Rating for Emotionally Disturbed Students; and Finding Children With Special Needs (Resource Management Systems, Inc.). Killen and Myklebust (1980) suggest that in Special Education, new methods of evaluation are needed; methods that will measure educational growth rather than specific mastery. They suggest that the large databases necessary to handle such research into evaluations could only be handled by a computer system.

Computers have also been used in diagnosis. Reich (et al, 1982) describes a structured Psychiatric interview both with child and parent, and the subsequent computer diagnosis. Computers have also been used to analyze and compare E.E.G.'s of psychotic children and high risk children with controls (Simeon, Jovan & Turan, M, 1975). Marlene Colborne and John McLeod at the University of Saskatchewan (1984) describe the use of a computer "expert" system to guide the classroom teacher in the diagnosis of the child's learning problem. Here the diagnosis is computer guided as the child may not be tested directly, but rather, the computer guides the diagnostician as to appropriate tests to administer. The particular expert system developed in Saskatchewan is an expert system to assist in the assessment of reading problems and uses the McLeod Educational Diagnosis Model. As the assessment proceeds, the nature of the child's problem becomes pinpointed by scrutiny of academic skills.

A large database of tests must be assembled with the aid of an educational diagnostician and programmer, and if such systems are structurally feasible, then the diagnostician or teacher can access the data base through means of a micro and modem, and not only reduce their workload, but have the advantage of computer analysis and correlation of results and patterns. Another advantage is that the diagnosis of the child can happen in his or her natural setting. In conclusion, this type of computer, (i.e. guided diagnosis) could be especially important in rural areas.

CAI INSTRUCTION (LEARNING FROM COMPUTERS)

Computer assisted learning will be seen as using the computer as tutor, tool or tutee (Metzger, Ouellette & Thorman, 1983). As a tutor, the computer will perform traditional CAI: drill and practice, tutorials, simulations and educational games. As a tool, it can be used by the teacher or student using the test; or in the capacity of worksheet generation; in word processing capabilities, or in the case of blind students as braille translations, etc. And as a tutee, it will function as a "dumb machine" to be programmed by the students. All three applications are important and should be used in a special education situation. Another factor in the learning process which is enhanced by the micro is motivation. Watkins (1981) feels this is a very important part, and this is backed by other researchers, among them Goodberlet, who quotes a teacher of the deaf as saying "computer drills are much more effective than workbook drills. Students are interested in improving their skills on the computer, but not in a workbook". Free computer time might also be used as a motivator for conventional assignment completion.

COMPUTER USE AS A TOOL TO ENHANCE LEARNING
(LEARNING WITH COMPUTERS)

The possibilities which were described in the communications section are also applicable to this section. Other handicapped students can use the computer as a tool to enhance learning, i.e. learning with computers.

For the Blind:

The Kurzwell Reading Maching (Bennett, 1982) which which is available in a desk top format, can read books, periodicals, magazines, etc. It can also back up or move forward so the listener can hear what he/she wants, locate and spell a particular word, control speech rate, etc.

Another application of computer technology in the education of blind students is the Versabraille system (Moore, M., 1983). In this system used by high school and college students, braille information is stored on audio cassettes rather than cumbersome paper. The micro controls the system enabling "pages" to be retrieved, editing to be accomplished and the system to be interfaced with another computer. Providing automatic transmission from text to braille are varied configurations such as pointers, braille writers, typewriters, and modems. This system was used by students for notetaking, preparation of assignments and communication with the computers. Teachers also used the system by typing their assignments on regular typewriters. In summary, this tool was generally found to be successful although the large battery necessary was cumbersome and heavy.

Another application is the DTB (Dumb Talking Box) developed by E. Carolina University which enables a blind student to actively participate in a chemistry lab. The box vocalizes readings and measurements. It can also be interfaced to other machines such as optical sensors, etc. The blind student can therefore learn more independently and make his/her own mistakes rather than a sighted aide. Also the computer can store notes on the procedures and results of the lab experiments.

A common business application of a microcomputer is as a word processor or text editor. This function can be utilized also in the classroom by both teachers and students. For learning disabled students who lack language competence, the word processor opens up the possibility of engaging in creative writing without concern for mistakes which would involve tedious rewriting if pen and paper were the chosen media.

The use of animation, graphics and the voice chip can also open up areas of the curriculum to children who are unable to read or understand the rules of numbers (Richards, C. 1983).

From a motor perspective, physically disabled students find work with a computer much easier than handling printed materials. Special adaptations allow various inputs of control (Evaluation report - Microcomputer Pilot with the Physically Disabled).

COMPUTER AS TUTEE:

The Logo system was developed by Seymour Papert and allows a child an easy access into the world of programming. In addition the language contains a powerful set of graphics and a text editing capability. The Massachusetts Institute of Technology Logo Group has been working with children who are physically disabled, autistic, emotionally disturbed and learning disabled using the Logo system and their conclusions are as follows: Logo places the child in control of the computer; he/she has to make decisions, solve problems and respond to feedback. This may be the first experience of independent initiative that physically disabled students, used to a more dependent role, have experienced. Another problem that the physically disabled child faces is a lack of experience in spatial concepts and manipulation of objects, which the normal child learns intuitively. The "turtle", either on the floor or on the screen, can be manipulated using minimum motor effort and coordination, thus allowing some learning to take place. For children who lack language ability but have spatial competence, Logo offers an opportunity to engage in problem solving activities in an area where reading skills are not of paramount importance. The response of the "turtle" to their commands gives all children experience in cause and effect relationships. The connection between their command to the computer and the movement of the turtle is explicit and obvious. Weir (1981) suggests that this relevance is especially important for autistic students, and may form a basis on which to build the idea of communication. She reports a case of an autistic boy who began to spontaneously use phrases describing the "turtle's" action rather than his normal meaningless monologue. Weir also mentions the high degree of motivation explicit in the length of time children want to work on the task. The benefits to the learner are said to be "the structured nature of the activities, the immediate feedback, the possibility of a concrete approach to abstract ideas, and the emphasis on the methods of doing things rather than on answers -- the emphasis on process rather than product". The child is in control of the "dumb machine" and must formulate problems to be solved by his program. Weir (1981) states that success with Logo has significant effects on the child's self-concept and self-confidence. Sprinthall and Sprinthall (1983) say that a student's feeling of self-directed competence is an extremely important factor in academic achievement, and teachers of Logo students have noticed a significant change in this area (Weir, 1981).

Basic is another programming language simple enough to be taught to children. Emotionally handicapped children are, by nature, often inflexible, but a computer is also inflexible (in its tutee role) and when faced with an object even more unforgiving of error than they are, the students are forced to admit mistakes and make corrections (Furst, 1981). Basic programming also helps the development of logical thought which is another weakness commonly associated with emotional disturbance. Again, the ability to program may improve the child's self-concept.

Drill and practice was the earliest form of computer assisted instruction and is the easiest to program for. (Plowright, 1983). These sessions serve to maintain and reinforce previously learned skills in a more motivating way than pencil and paper; however, the consultative committee on computers in schools in New Zealand points out that this is an underutilization of the capacity of the computer. Nevertheless, Ruggles & Harrod (1983) are of the opinion that if drill and practice exercises are needed, and a computer is available, then it should be used for that purpose. They also point out that modern theory implies that certain basic skills must be automated rather than merely learned, and that drill and practice routines would strengthen this type of overlearning. Ruggles and Harrod also caution that software evaluation is necessary, as many drill and practice programs are available commercially.

Berthold & Suchs (1974) state that many important characteristics of a special education program, such as a graded series of tasks for each individual, a definite structure, a learning environment where stress is reduced to a minimum - can all be provided by a computer. They also say, "Teaching machines provide clearly defined stimuli and expectations, active responses, immediate reinforcement and a gradual increase in the complexity of material. Machines have infinite patience, minimize social stress, and often reduce factors like teacher motivation and negative preconceptions about a child's ability". This view is supported by many researchers, among them Chiang (1978), Watkins (1981), Hannaford (1982), and Furst (1981).

Watkins (1981) also points out that many exceptional children do not learn by conventional methods. Furst (1981) suggests that learning disabled students are often inattentive and a computer may serve to command attention. This view is supported by Ryba (1982), who noticed that students remained on task despite background interruptions. Ryba also points out that students frequently verbalize their interactions with the computer, and noted Brown (1975) for showing that verbal self commentaries can significantly increase affective learning. Ryba suggests that learning to operate a computer, even if only used with games, may help mentally retarded children to develop attention to relevant task aspects and increase organizational skills. Battenburg (1983) suggests that touch sensitive screens and audio computers can help to focus the students attention on relevant aspects. Dr. Ryba in conjunction with Dr. Chapman is at present conducting research into the transfer of processing strategies. Ryba (1982) states that one of the aspects of computer learning is the extent to which students/users are, or perceive themselves to be in control of their learning environment. Crandall (1977) proposes that computer assisted instruction could be used to build effective internal control in students who perceive their successes/failures to be of external origin. He cites 1) immediate feedback, 2) absence of external factors that students can attribute to their success/failure, 3) specific directions by the computer and its intolerance for deviations, 4) one to one relationship between student and computer, and 5) successful learning experiences available with most CAI courseware.

Hannaford (1982) states that students become active learners in a self-paced sequence of incremented steps. Ryba (1982) quotes individual students as saying they like CAI because "I can go at my own speed and level". Mason (1982) suggests that this results in a better self-concept and increased academic ability. Mason also asserts that teaching with the help of a microcomputer reduces the amount of time necessary for skill mastery. Physically disabled students also state that interaction with material is an important advantage. Teachers interviewed by Ryba (1982) suggest social and emotional advantages of CAI on more computer usage with exceptional students.

There are many possible applications of computer assisted teaching using drill and practice, tutorials or a combination, particularly when graphics, computer controlled slide displays, audio capabilities or interactive videodisc programs are incorporated. The lesson then becomes multisensory.

(To be continued on page 47. - SPECIFIC APPLICATIONS)

SPECIFIC APPLICATIONS

Computer assisted instruction has been used extensively with deaf children. Suppes et al. describe the effectiveness of a mathemathics Strand program on the acquisition of computation skills of hearing impaired students. The authors report gains equal to normal hearing students, and also cite that greater gains were experienced with greater exposure. Integral to this program were individualized instruction, acceleration in proficiency areas, drill in deficiency areas and daily reports on pupil progress. Fletcher and Suppes (1973) and Culbertson (1974) report successes of CAI in mathematics and language arts with deaf and hearing impaired children. Hoffmeyer (1980) says that at the Florida School For the Deaf and Blind, the CAI curriculum in maths, language arts and reading produced gains in functioning levels greater than those of the national average. Apart from regular curriculum material, some special applications are available for deaf students. Weyer (1973) describes Fingex - a program to teach finger spelling to deaf children. The Speech/Text Synchronization System which combines speech signals with corresponding pointed text assists pre-lingually deaf students in internalizing the English language (Sargent & Nyerges, 1979). Nickerson, (1976) and Boothroyd and others (1975) describe computers used as speech training aids through the analysis of voice patterns, which become visible on a computer screen for the student. The child can "hear" his or her voice on the screen and compare it with a model. Withrow (1980) describes a project which combines television, videotape and 3 dimensional graphics to provide new language experiences for deaf and hearing impaired students. And finally, ILIAD provides Interactive Language Instructional Assistance for the Deaf (Katz 1980).

Another group of students to benefit in a variety of ways are the mentally retarded population. Hallworth, Brebner and Brown (1980) suggest that if certain principles of learning and problems specific to the mentally retarded are taken into account, then CAI can be used effectively with this population. These considerations are 1. minimizing the load on short term memory, 2. emphasizing relevant stimuli, 3. providing repetition to facilitate overlearning, 4. minimizing on-screen text, and 5. motivating through immediate reinforcement of success. Various programs are available on different aspects of the curriculum - prereading skills (Eaton, 1975), sight/word recognition (Tally, 1981), word decoding (Spring & Perry, 1980), reading/reading comprehension (Rosenkranz, 1981), vocabulary instruction (Nelon, 1972), number conservation, (Lally, 1980), social arithmetic skills such as money handling (Holz et al, 1979) - all of whom report success with E.M.R. students. Other applications specific to the mentally retarded population are programs to assist with learning social/life skill vocabulary. Holz (1976) combined computer with slides to assist in generalization of learning, banking skills (Sandals, 1973) and various forms of vocational training (Brebner, Clark & Johnson).

Learning disabled students make use of the incremental, self-pacing, branching, reinforcing and motivation aspects previously described. This serves to individualize their learning environment and to ensure success with a corresponding increase in self image (Taber, 1981). Sementana and others (1975) describe an oralographic reading program for L.D. nonreaders which in 7/8 months raised their decoding and reading abilities to a 2nd grade level. McLeod (1983) and Hassebring and Crossland (1981) describe programs for computer assisted diagnosis, assessment and remediation of spelling problems with learning handicapped children, and report it as an efficient and cost effective method of dealing with such problems. Continuously evaluating programs in all subject areas is useful when working with learning disabled students. The use of LOGO has been discussed previously.

Socially/emotionally disturbed children interacting with a math CAI had significantly greater gains in test scores and also in time spent concentrating on the task. Haberman (1977) suggests that CAI minimizes miscommunication problems and creates an objective, fair and non-threatening approach to learning. Corman and Kosberg (1982) also demonstrated accelerated learning and increased attention to task with emotionally disturbed students. Computer modifications such as locking the keyboard or in-program messages can be used to slow the student down until enough time for a reasoned response has elapsed (Grimes 1981). Again, relevant stimuli and positive reinforcement are important.

Computers have also been used with success in language development of autistic children. Taber (1983) and Colby (1973) have also successfully used the computer to stimulate processing of symbolic information, and to correlate that with human voice sounds. Children self-select and self-direct their own keyboard play. Finally, the uses of LOGO have been discussed previously, which also has relevance to the language development of autistic children.

Visually impaired and physically disabled applications are basically those previously described in this Chapter under the sections of "Communication", and" Computer As Tool". Another important aspect is the possibility for treatment of rural handicapped children in their own environment (Tawney, Aeschleman, Deaton & Donaldson 1979).

SUMMARY

John McLeod (1983) lists these advantages for CAI in a special education program:

1. Law of Frequency - repetition
2. Motivation
3. Multisensory Stimulation
4. Attention - focussing
5. Learning by Doing
6. Immediate Feedback

7. Learning Material Graded For Difficulty

Plowright (1983) sees the trends in computer learning at this time as, "...individualization of learning becoming more sophisticated. ....visual environments are increasingly interesting with graphics, animation and the use of full video with videodiscs. ....applications are more involving using simulation, animation, 'socratic dialogues', and so on. ....use of intelligent systems is advancing".

CHAPTER THREE

REVIEW OF COURSEWARE/SOFTWARE AND RELATED HARDWARE

The availability and accessability of software is a major issue for special education teachers. In fact, special educators are commonly asking themselves questions such as where do I begin to look in the milieu of sources available; how do I know from a catalogue description, if that is the program I need? What if I find the right program but my special needs student cannot use it because of fine motor difficulties? Many of the same questions raised above about software accessibility also plague the entire issue of software availability - but the possibilities of using such a tool with a special needs student are too great to ignore, despite the complexity of software decision-making. Many special needs students require individual tutors, and the computer can readily act in that mode, - patiently waiting for response, offering immediate correction, etc. It can also provide access to highly intellectually stimulating activities through simulation and programs like LOGO. What this report will try and do is to look at the types of programs currently available; how to find sources of programs; examine what kinds of hardware modifiers are available; and discuss the issue of disseminating this information to the classroom teacher, the parent, and the post secondary educator and/or trainer.

Uses of computers in the classroom have generally fallen into three categories: learning from computers, learning with computers and learning about computers. Learning from computers would include drill and practice, simulation and tutorial programs. Drill and practice programs are "intended to reinforce through rote learning, a skill previously taught, and to test the knowledge of that skill. A simulation gives the student control of a real situation, task, or environment on the computer. She or he can make choices and decisions and see the results and effects of the decisions instantaneously. Tutorials attempt to emulate a model teacher's behaviour by directing the student's learning based on his or her performance, i.e. where he or she makes errors and what kind" (p. 38, Bits and Bytes Handbook). Learning with computers generally includes uses of the computer as a tool. This would include word processing, use of the computer as a communication tool, LOGO, etc. Learning about computers is also called computer awareness or computer literacy and would include keyboard familiarization, programs teaching about computer use, etc.

The area of learning from computers is the one best supported by manufacturers currently. Appendix E and E.1 clearly show this. The majority of these programs are of the drill and practice type. The programs range from simple counting type programs to programs that teach basic skills. Most of these programs are suitable for use with developmentally handicapped students or learning disabled students. They would be suitable for use with other special education populations where appropriate and accessible. Programs listed as being suitable for Developmentally Handicapped students are generally of a lifeskills type nature; programs on money, early learning skills, telling time, etc. Programs for Learning Disabled students include most skill-building academic type programs. These would include math and language arts drills. The majority of these programs have not been specially written for use with special needs students. Many are programs designed for regular classroom use, but whose nature allows for use over a wide age span. Attention should be paid to the suitability of this kind of program, and such things as print size and content should be checked according to the age of the student to use them. Often this type of information can be obtained from software evaluations (see Appendix G for sources of evaluations.)

Programs for other special needs groups were not as readily available. This is particularly true of programs for gifted children. There were very few programs that even suggested use with gifted children, though many programs for higher grades would be suitable. Some interesting programs exist for use with hearing impaired students. These include programs to teach finger spelling and even a program to teach lip reading. Programs for the physically handicapped were largely programs that had modified input; for example, a switch would be used to input data rather than the keyboard.

The learning with computers category provided some interesting programs and applications. Word processor programs dominate this category. One company offers a system to print large characters on the screen for visually impaired students, while others allow easy input for physically handicapped students as well as easy to follow instructions for use with learning disabled students. The potential of using LOGO with special needs students is one that should not be overlooked. LOGO has been used in a variety of special needs situations and has been particularly successful with physically handicapped students. A visit to the Cotting School for physically handicapped students demonstrated it being used across the grades as a way of teaching spatial arrangements.

Learning about computers is not as well supported with software. The few programs that do fall into this category are keyboard learning activities as well as a few programs on computer terminology and introductory programming.

Appendix E and E.1 contain lists of software and companies producing them. The list has been sorted according to disabilities and then according to the learning from, learning with and learning about categories. The learning from category is further broken down into D-drill, S-simulation and T-tutorials. Company names are coded, and the addresses can be found in Appendix F. The software is available from a number of types of sources. Some is available from large, well-established companies, some from third party sources, and some straight from the developer. Some companies offer very inexpensive sources of software, for example, Computers to Help People. Appendix E and E.1 also contain information on software for teachers and administrators. These are indicated by a T in column three. A variety of types of programs exist for teacher use. These include authoring programs (programs that allow the teacher to develop CAI material easily), grading programs for calculating marks, record keeping programs and Individual Educational Programs (I.E.P.) development programs. A number of testing programs are available as well in many areas. Administrative programs include scheduling packages, budget programs and record keeping programs.

Software evaluation is of particular importance to the special needs educator. Not only should it tell us of the suitability of programs for various ages, but software vendors should also provide information on accessability of the program. Some programs allow for use of input by switches, thereby allowing use by physically handicapped individuals; others allow large print options or braille print options enabling visually impaired persons to use the material. Evaluations can guide wise spending of finances, especially when companies do not allow preview of materials. Some sources of software evaluations, specifically for special needs students, are noted in Appendix G.

Another issue in the use of computers for special education is hardware. A number of devices are available for a variety of special needs. Companies offer many types of switch devices including the pneumatic switch, leaf switch and tread switch. The pneumatic switch allows for activation of the switch by a puff of air or a sipping motion; the leaf switch can be used in any area that will allow for its compression (this could be under the chin, behind the knee, etc.); and the tread switch allows for activation by stepping down on it. These can be used in conjunction with software designed for switch input. Generally these programs scan lists of choices at input points in a program, and when the desired choice is highlighted, it can be input by activating the switch. Other switch arrangements include boxes with rows of switches, each switch corresponding to a choice in the input section of the programs. These boxes often have guides between the switches to ensure activation of only one switch at a time. This input technique has also been used in the development of word processing packages for physically handicapped persons (see software list).

Hardware modifiers are also available for use on the regular keyboard. A variety of pointers are available as well as keyboard guides. The guides overlay the original keyboard and help to ensure that only one key is struck at a time. Other companies have developed ways of overriding the keyboard input entirely and offer instead, boards that allow input from a switch and light controlled board offering standard letter and character input. This device allows use of any standard programs available for the microcomputer to which it is attached.

Another way of bypassing keyboard input is through the use of voice input. This is usually controlled through a device connected to the computer. The device allows you to preset a vocabulary list and then the user is allowed to input information through the voice input device to the computer.

Hardware modification of computers also allows for a variety of output devices. Here again, speech synthesis plays a role; but in this case as an output device. A variety of voice output devices exist, making the computer a more accessible device for the visually impaired. Some word processor packages, utility packages and games are available for use with these devices.

Speech synthesis is the basis for communication devices available for use by non-speaking people. These devices range from having a small set of vocabularies, to allowing development of larger vocabularies and one-strike entry of whole words. One device allows for voice synthesis communication back and forth across phone lines as well as enabling access to telecommunications.

Hardware devices, besides voice output modes, also exist for use with blind and visually impaired persons. One such device is a special monitor that allows for displays up to 16 times the size as on a normal monitor. Braille printers are also available as well as devices that allow for storage of print that can be output as Braille, thus allowing for convenient transmission and storage of information in Braille form.

We can now see that a reasonable amount of software and hardware exists for use with special needs individuals. Given this information, how do we find out about it, and more importantly, how do we keep up with what is currently available? Appendix I lists sources of information. Included in this are newsletters, some journals and other publications, as well as a growing number of databases and bulletin board systems. The majority of those listed have been developed by handicapped individuals or organizations supporting them. Many offer special facilities for use by special needs individuals; for example, one service offers dial-up databases usable by the deaf through special phone lines. Some publications of this type are produced and available through manufacturers; these show uses of their materials and suggest new uses, and also serve to update and inform about additional uses of their product.

Of particular note as an information source is Trace. Trace Research and Development Center for the Severely Communicatively Handicapped is out of the University of Wisconsin-Madison. The organization offers a variety of publications including a software/hardware registry, a non-vocal communication resource book, comparisons of equipment and a number of reprints on specific topics. Edu Tech, another company, provides a series of annotated bibliographies that are of great help to the researcher. In Canada, the Ontario Crippled Children's Centre has published progress reports of research from the Rehabilitation Engineering Department and Augmentative Communication Service.

The Handicapped Education Exchange is a another service, and free to those involved in the education of, or communication with, the handicapped. It is run as a computerized bulletin board and available through phone lines via an ASCII or Baudot terminal. It is "*A way for the handicapped, and those assisting the handicapped, to make known what sort of devices they need. *A way for those qualified to provide technical assistance to the handicapped to find out what they might be doing to help. *A way for those actively involved in designing aids for the disabled to offer suggestions to, and get help from others who are similarly engaged. *A way for those having products, services, or information of potential use to the handicapped to make known their availability. *A way of disseminating information about organizations and programs useful to the handicapped. *A way of demonstrating the usefulness of computerized bulletin boards to the handicapped." (HEX Information letter). This exchange provides some interesting possibilities for the problem of information availability.

Conferences also provide good sources of current information on availability and suitability of software and hardware. A number of conferences have been held in the past year that specifically looked at the issue of the computer for special needs individuals. Moreover, conferences held sessions or displayed appropriate materials for this use. Many of the organizations listed offer information about these conferences.

Other sources of information are articles, evaluations, announcements, etc. in a variety of computer journals and special needs journals. Many have devoted special issues to the topic, and provide excellent background research. The list provided only indicated specifically designated computers and special needs sources.

But the information available is still fairly scattered. Discussions with special needs educators indicate concern with the lack of readily available information, the lack of Canadian materials, the uncertainty of buying materials from small unknown producers and the lack of information on how to adapt programs.

Teacher training is certainly a part of the answer, but ready accessability to information is probably the most efficient step. The most viable suggestion that has been made is the development of a clearinghouse where evaluations, information and recommendations gathered from the variety of existing sources are compiled and made available upon request.

SUMMARY

In conclusion, a variety of sources of software and hardware exist, including major companies, individuals and organizations. Software is most readily available for use with learning disabled students and developmentally handicapped students, but this material will often prove useful with other special needs individuals. This software is often not produced for specific use with special needs groups, but its nature lends itself to this use. Information about suitability and accessability of software is most readily available through a variety of software evaluation sources. Evaluation sources specific to special education are available.

Another way of making computers available to special needs people is through the use of adaptive hardware. This takes many forms; switches enabling input in a variety of ways; voice input and output; keyboard guards; pointers, etc. Some of these require special software to make use of the hardware, but some allow for use of existing programs.

Information sources exist for the dissemination of this information. These come in the form of journals, newsletters, bulletin board systems and conferences. Such sources can provide current information as to the uses of computers with special needs individuals. Getting this kind of information into the hands of those who need it would probably best be served by a clearinghouse type concept, whose job it would be to collect existing information and evaluations and make them available where necessary. However, the most efficient way of making this information available might be through the establishment of a bulletin board system.

CHAPTER 4

COURSEWARE AND SOFTWARE INITIATIVES

In the previous two chapters there has been a review of research using computer applications for special needs individuals, and also a summary and overview of courseware and related hardware that is available in both published and unpublished form. In this chapter, there will be a presentation of some of the potential courseware and related hardware developments that will be needed and developed through the implementation model that is discussed in depth in Chapter 5. It was mentioned in Chapter 1 that the Sandals' Generic Model is recommended for use as a conceptual organizer for the potential applications of courseware and related hardware that can be used for educational or training purposes with special needs individuals. It should be noted that many of the potential software applications can be used and generalized to more than one special needs group and, in fact, some courseware applications with the proper hardware modifications may be used by most of the groups.

In England, Richards, who is head of one of the four

National Centers for Special Education Teaching and Training With the Microcomputer, has specified that the major curriculum objectives for these courseware programs should be centered around the following four themes: SKILLS, SUBJECTS, EXPERIENCES and ATTITUDES. Dr. Mary Wilson's Curriculum in Special Schools is highlighted in Table 1 to clarify some of Richards' concerns.

> "Dr. Mary Wilson's THE CURRICULUM IN SPECIAL SCHOOLS, considers building a balanced curriculum through the acquisition of skills, subject orientation, areas of experience and attitudes. Within the 'Attitudes Column' we might incorporate values. Values represent the hidden curriculum. Children with special needs fail throughout the hidden curriculum, and whilst it is often the most difficult to handle it is probably the most important. Areas of experience need to be considered with care. It seems likely that if special education is going to change to meet tomorrows needs then we will have to rethink this particular area. Certainly the importance of subject area orientation is greatly outweighed by any of the three other areas. Rather than asking simply what software is available for a particular machine, perhaps one should begin by posing the question how can the computer be used to enrich the range of experiences offered to the children. At least when asked from this standpoint the teacher has a criteria for evaluating software." (From C. Richards, Working Paper of the Newcastle Semrec Part of the National Microelectronics in Education Program, "USES OF THE MICROCOMPUTER WITH CHILDREN WITH MODERATE LEARNING DIFFICULTIES IN SPECIAL AND ORDINARY SCHOOLS", 1983.)

As can be seen, the British have a much broader view of any courseware generation than just the specific subject

BEST COPY AVAILABLE

TABLE 1

Taken From "THE CURRICULUM IN SPECIAL SCHOOLS"
DR. M. WILSON, LONGMANS 1981

SKILLS	SUBJECTS	EXPERIENCES	ATTITUDES
LISTENING	ART	AESTHETIC/	SELF-CONFIDENCE
SPEAKING	CRAFT/HOME	CREATIVE	SELF-DISCIPLINE
READING	ECONOMICS	LINGUISTIC	CONSIDERATION
SPELLING	ENGLISH	MATHEMATICAL	ADAPTABILITY
HANDWRITING	FOREIGN	PHYSICAL	PERSEVERENCE
COMPUTATION	LANGUAGE	SCIENTIFIC	CONCENTRATION
MEASUREMENT	GEOGRAPHY	SOCIAL/	INITIATIVE
INVESTIGATION	HISTORY	POLITICAL	SENSITIVITY
DEXTERITY	MATHEMATICS	SPIRITUAL	IMAGINATION
AGILITY	MUSIC	ETHICAL	
SELF-CARE	PHYSICAL		
	EDUCATION		
SOCIAL SKILLS	RELIGIOUS		
	EDUCATION		
	SCIENCE		

Referred in Colin Richards' working paper, Newcastle SEMREC.

orientation.

****Thus in specifying any specific software/courseware creation in any detail right now, except within any broad generalities, would take away from the lattitude and creativity of those at the proposed Canadian Centers of Excellence (Chapter 5) who may have many unique ways of creating courseware around the four areas mentioned above (Skills, Subjects, Experiences, Attitudes).****

Based on this British Approach to curriculum development for special needs individuals, it is clear that it would be helpful to look at a summary of the British initiatives for "MICROELECTRONICS AND CHILDREN WITH SPECIAL EDUCATIONAL NEEDS". A summary of MEP special education curriculum development projects appears in Appendix D.

****This author is not recommending that we should imitate the British program in any defined way. However, our proposed research Centers of Excellence should use their ideas and projects as a way of leapfrogging ahead of them, if that is at all possible.****

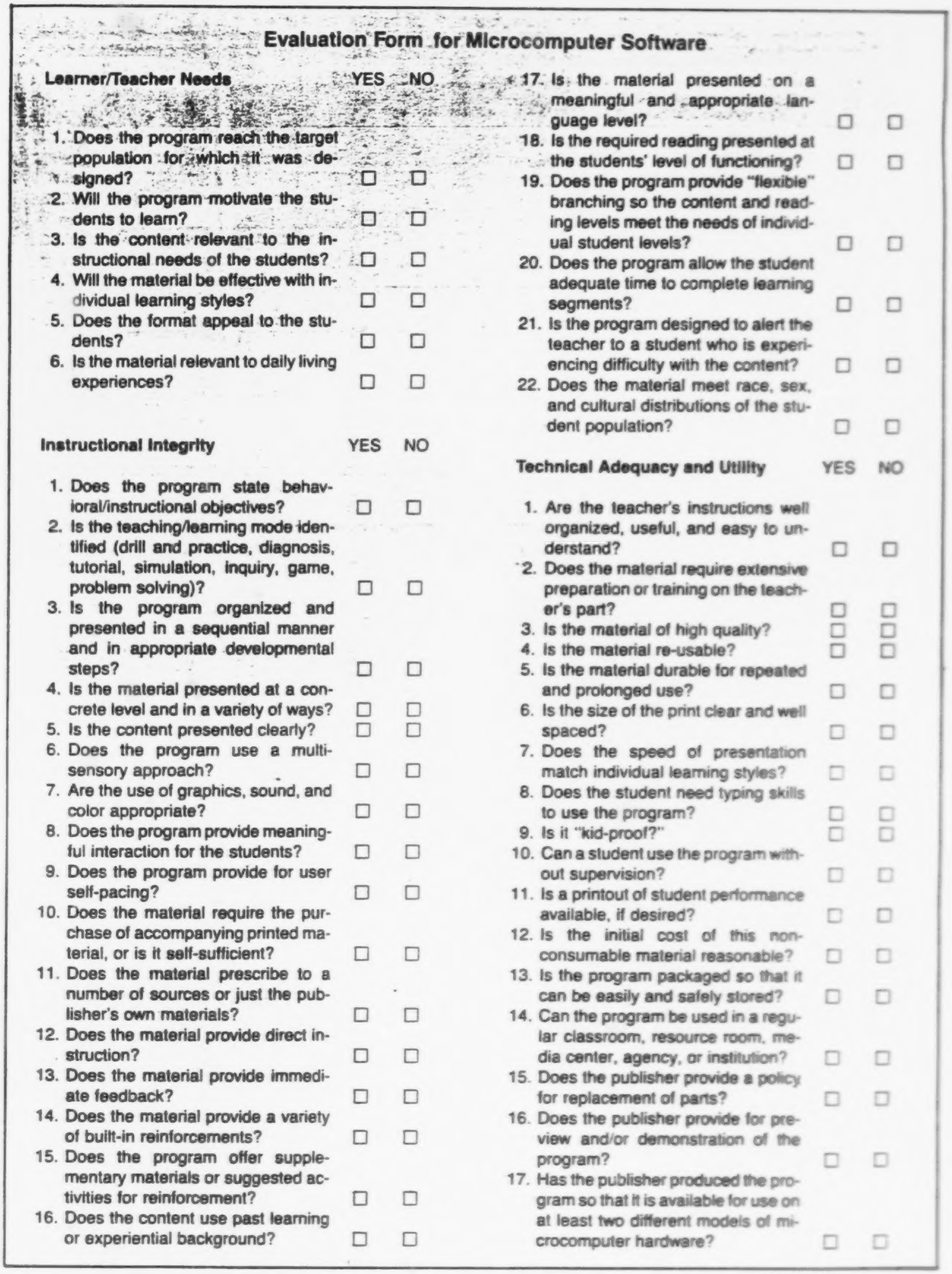
This author would like to focus on the fact that most of the British theory in this area is limited to children and adolescents, and as a result, less attention, if any, has been addressed to the special needs adult. This Canadian proposal is broader in that many of our centers will also focus in on areas known as 'life skills' or 'survival skills'. Thus, even though the British have a great jump on us because of their organized cooperative approach to microcomputer based educational needs through their Federal and local educational authority sponsored MEP Project, and their four SEMRECS we still can catch up by looking at their success and non-success. The proposal for a national policy outlined in Chapter 5 should allow us not only to catch up with the rest of the Western World in this area, but in three years we should be the world leaders in research/development and evaluation in this area.

COURSEWARE CHARACTERISTICS

In 1981 in "TEACHING EXCEPTIONAL CHILDREN", Hannaford and Sloane put forth an excellent summary of those factors and issues that should be considered not only for the evaluation of courseware and the related hardware special needs individuals, but also for those research and development groups involved in the creation of said courseware. In Table 2 , there is a summary of these concerns broken down by three major headings: 1) Learner/Teacher needs, 2) Instructional Integrity, and 3) Technical Adequacy and Utility. There are several evaluation and development standards referred to in earlier sections of this paper such as EPIES, MECCS, MICROSIFTS and CALIFORNIAS, but this one is probably the most realistic when addressing the courseware concerns of special needs individuals. In preparing the courseware and hardware developments in Canada for special needs individuals, issues raised by Hannaford and Sloane and others like them should be closely followed as a guide in planning. This does not preclude the fact that the proposed Canadian centers and/or board and director will not come down with an even more comprehensive and thorough approach to evaluation and courseware creation. In fact, it is hoped that an outgrowth of the R & D in the first year alone should set new world standards for courseware creation and evaluation in this area.

HARDWARE STANDARD

TABLE 2 BEST COPY AVAILABLE



Evaluation Form for Microcomputer Software

Learner/Teacher Needs	YES	NO
1. Does the program reach the target population for which it was designed?	☐	☐
2. Will the program motivate the students to learn?	☐	☐
3. Is the content relevant to the instructional needs of the students?	☐	☐
4. Will the material be effective with individual learning styles?	☐	☐
5. Does the format appeal to the students?	☐	☐
6. Is the material relevant to daily living experiences?	☐	☐

Instructional Integrity	YES	NO
1. Does the program state behavioral/instructional objectives?	☐	☐
2. Is the teaching/learning mode identified (drill and practice, diagnosis, tutorial, simulation, inquiry, game, problem solving)?	☐	☐
3. Is the program organized and presented in a sequential manner and in appropriate developmental steps?	☐	☐
4. Is the material presented at a concrete level and in a variety of ways?	☐	☐
5. Is the content presented clearly?	☐	☐
6. Does the program use a multisensory approach?	☐	☐
7. Are the use of graphics, sound, and color appropriate?	☐	☐
8. Does the program provide meaningful interaction for the students?	☐	☐
9. Does the program provide for user self-pacing?	☐	☐
10. Does the material require the purchase of accompanying printed material, or is it self-sufficient?	☐	☐
11. Does the material prescribe to a number of sources or just the publisher's own materials?	☐	☐
12. Does the material provide direct instruction?	☐	☐
13. Does the material provide immediate feedback?	☐	☐
14. Does the material provide a variety of built-in reinforcements?	☐	☐
15. Does the program offer supplementary materials or suggested activities for reinforcement?	☐	☐
16. Does the content use past learning or experiential background?	☐	☐
17. Is the material presented on a meaningful and appropriate language level?	☐	☐
18. Is the required reading presented at the students' level of functioning?	☐	☐
19. Does the program provide "flexible" branching so the content and reading levels meet the needs of individual student levels?	☐	☐
20. Does the program allow the student adequate time to complete learning segments?	☐	☐
21. Is the program designed to alert the teacher to a student who is experiencing difficulty with the content?	☐	☐
22. Does the material meet race, sex, and cultural distributions of the student population?	☐	☐

Technical Adequacy and Utility	YES	NO
1. Are the teacher's instructions well organized, useful, and easy to understand?	☐	☐
2. Does the material require extensive preparation or training on the teacher's part?	☐	☐
3. Is the material of high quality?	☐	☐
4. Is the material re-usable?	☐	☐
5. Is the material durable for repeated and prolonged use?	☐	☐
6. Is the size of the print clear and well spaced?	☐	☐
7. Does the speed of presentation match individual learning styles?	☐	☐
8. Does the student need typing skills to use the program?	☐	☐
9. Is it "kid-proof?"	☐	☐
10. Can a student use the program without supervision?	☐	☐
11. Is a printout of student performance available, if desired?	☐	☐
12. Is the initial cost of this nonconsumable material reasonable?	☐	☐
13. Is the program packaged so that it can be easily and safely stored?	☐	☐
14. Can the program be used in a regular classroom, resource room, media center, agency, or institution?	☐	☐
15. Does the publisher provide a policy for replacement of parts?	☐	☐
16. Does the publisher provide for preview and/or demonstration of the program?	☐	☐
17. Has the publisher produced the program so that it is available for use on at least two different models of microcomputer hardware?	☐	☐

From Hannaford & Sloane, "MICROCOMPUTERS: POWERFUL LEARNING TOOLS WITH PROPER PROGRAMMING. Teaching Exceptional Children, Nov. 1981.

It is expected that many of the special interfaces, such as those that have been developed and discussed by Parnes and Nelson and their colleagues, are going to be used and improved upon in any new courseware developments. These include scanners, remote sensors, and other sophisticated input/output single and multiple switch devices. Where necessary, foreign interfaces will also be used and/or modified to provide their maximum potential to the learning or training session. Such new and widely available I/O devices such as the popular Koala Pad, Power Pad, Joy Stick controllers, track balls, etc. and Speech Generators should be considered in any courseware creation for special needs individuals in any of the categories listed in the Sandals' model. The creativity and inventiveness of the centers to be mentioned in Chapter 5 may be developing within the first two years new input/output devices which today may go beyond our ability to predict.

****At this time it is too premature to specify any one microcomputer for any specific special needs group, application or center. Up to this point in time, the Apple II/IIe has been the most widely used computer for special needs individuals, but the technology is now six to eight years old, and to mandate this or any of the other 8 bit computers of the last decade would be foolish and shortsighted. The IBM computer has become a defacto microcomputer standard over the last two years for 16 Bit computers, and with the advent of the new Apple MacIntosh computer, the international leader will not be established for two years. In addition, the Ontario Educational Microcomputer Standards have been incorporated in the Canadian educational microcomputer companies Icon/Lexicon Computer System. If this computer and its related general and specific courseware grows as fast as the Ontario Ministries believe, may actually just become a Canadian Educational Standard. Again, this national acceptance will not be apparent for approximately 18-24 months. Thus it is recommended that the Centers for Research and Development should over time, develop the hardware standards and try to make the courseware as transportable as possible through software control and graphic presentations through laser video disks, etc. Also, the effective use of instructional design theory and the related documentation will insure some transportability if the proposed courseware is made available on different microcomputer systems.****

LANGUAGE AND COURSEWARE AUTHORING STANDARDS

There are many languages such as BASIC, PILOT, C, PASCAL and system machine languages that have been and are being used for the authoring of microcomputer based courseware. Some courseware developers have been developing 'run only' systems that have been authored on mini or large mainframe computers such as TUTOR (Plato), Can-8 (OISE-Honeywell), and NATAL (NRC-Honeywell).

****For the same reasons as mentioned in the hardware initiatives, the standards for the next five to ten years for both hardware and software/courseware languages will probably become clearer in the next year or two. This does not mean that we can wait until then, but we should be planning for a hardware and authoring standard for Canada if at all possible, or at least a language that will have transportable characteristics. Perhaps the Ontario initiative for hardware and the related languages will become that standard; only time will tell.****

The expertise in the proposed Canadian centers will more than likely come to grips with these problems, even if it means adopting a special learner micro/terminal such as the one developed by the University of Calgary group led by Mckinnon, called CAITER. The issues of compatibility itself is one major reason for carrying through with the recommendations that are now to be presented in Chapter 5.

CHAPTER FIVE

NATIONAL IMPLEMENTATION PLAN AND POLICY

NATIONAL NEEDS AND TARGET GROUPS

Before introducing a national plan and policy, it is imperative that there should be a reaffirmation of the need for this national plan and the direct and indirect target groups that will benefit from this national policy.

In Chapter 1, there was a summary of the social needs and programs that are presently being carried out in order to introduce micro computer based technology for special needs individuals. We are spending millions and perhaps billions of dollars in the area of job creation, industrial incentives for high technology and application development funds to integrate this hardware and software in such industries as the following: automotive, agriculture, garment manufacturing, aerospace, etc.. At the same time, we are also spending enormous funds on health, education, career training, etc. We are also enacting legislation to protect citizens from injustices caused because of an individuals' sex, race, or degree of handicap. Thus both federal and provincial agencies have been more than willing to allocate funds and resources to those areas that directly or indirectly affect special needs individuals on the one hand and the technology/industrial sector on the other.

> What this proposal is trying to do is to bridge the educational and career oriented needs of the special needs individual with our Canadian expertise in hardware and courseware/software in order to make the fulfillment of their needs and role in Canadian society a complete one.
>
> The target groups that will directly benefit from such a policy would be Canadian citizens from approximately three years of age to those in the so-called post retirement years in their 60's and 70's. The degree of special needs will include the physically handicapped, the developmentally handicapped, the gifted, those with learning problems and disabilities, the hearing impaired, the blind, and the culturally disadvantaged (for example; those in prisons, those with English as a second language, new immigrants and others such as native people). Those who will be indirectly affected from an economic and research point of view include the universities, the schools in general, since some of this courseware can be used with the general school and university population, and business and industry in the creation of new jobs.

This proposal and the needs expressed have been given a favorable response from provincial representatives, schools, federal agencies and those themselves with special needs. For these reasons the following national plan and proposal has been set forth.

INTRODUCTION

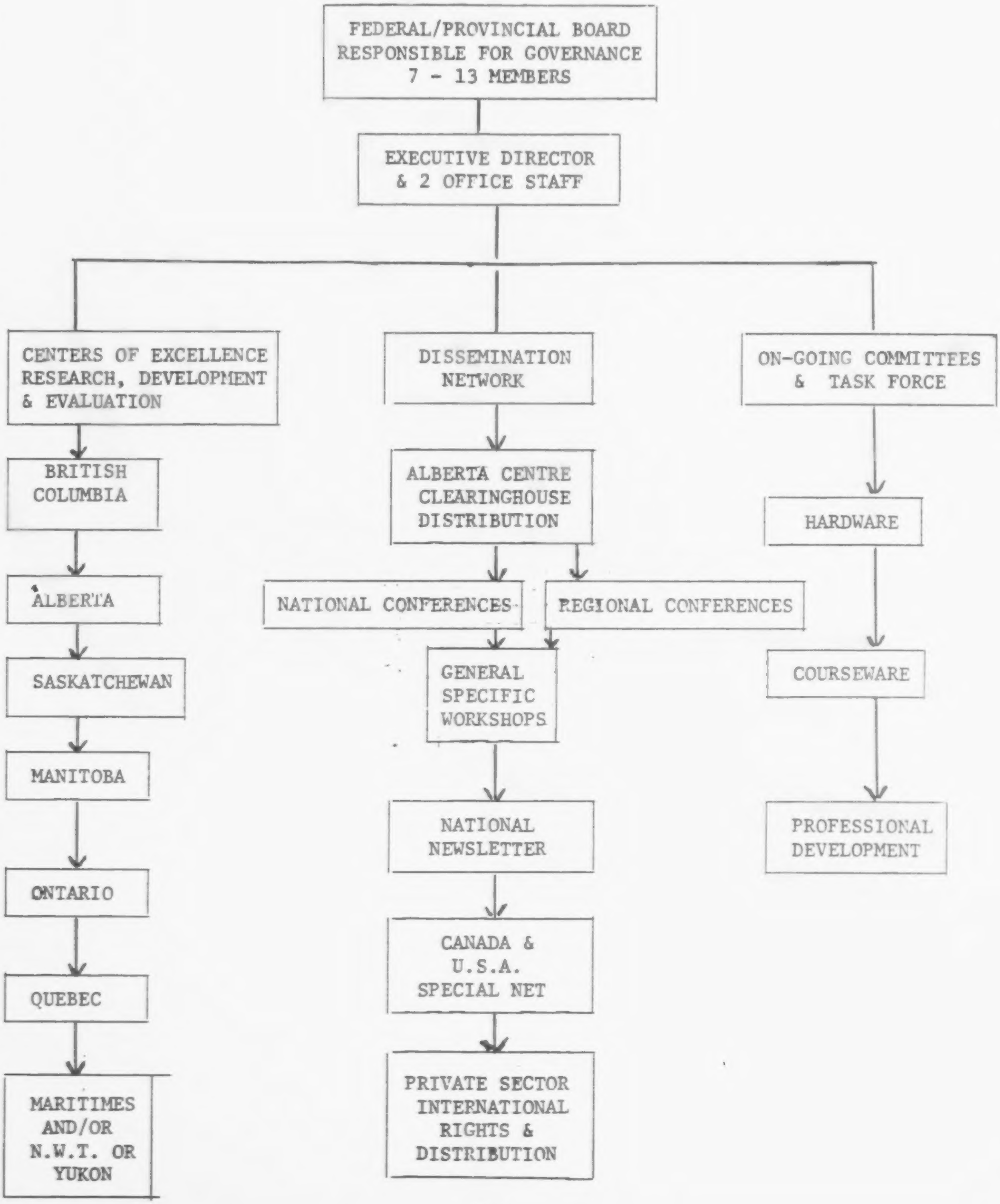
In the establishment of a national policy in any cost shared area, it is necessary to first specify the major components. In Figure 3 there is a block diagram representing the overall implementation for this D.O.C. report.

In Figure 4 there is a similar overview which shows the same information, but in a way which represents where the center of the focus of control is and how that effects the final consumer and user of the national courseware and research and development efforts.

In Figure 3 the main governance lies with a joint Federal/Provincial board which is the final decision-making group for policy, finances, personnel and any other responsibilities as assigned. The board will have three staff: an executive director, and one research and one secretarial staff officer. There are three major initiatives that are the responsibility of the executive director. These responsibilities are: 1) National Centers for Excellence, Research, Development and Evaluation of Computer Courseware for Special Needs Individuals; 2) a National Network for the Dissemination and Distribution of Information and Courseware; and 3) National and Regional Ongoing Task Forces and/or Committees.

Figure #3

ORGANIZATIONAL BLOCK DIAGRAM OF
NATIONAL IMPLEMENTATION POLICY


FEDERAL/PROVINCIAL BOARD RESPONSIBLE FOR GOVERNANCE 7 - 13 MEMBERS
EXECUTIVE DIRECTOR & 2 OFFICE STAFF
CENTERS OF EXCELLENCE RESEARCH, DEVELOPMENT & EVALUATION
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
MARITIMES AND/OR N.W.T. OR YUKON
DISSEMINATION NETWORK
ALBERTA CENTRE CLEARINGHOUSE DISTRIBUTION
NATIONAL CONFERENCES
REGIONAL CONFERENCES
GENERAL SPECIFIC WORKSHOPS
NATIONAL NEWSLETTER
CANADA & U.S.A. SPECIAL NET
PRIVATE SECTOR INTERNATIONAL RIGHTS & DISTRIBUTION
ON-GOING COMMITTEES & TASK FORCE
HARDWARE
COURSEWARE
PROFESSIONAL DEVELOPMENT

In Figure 4 there is a different representation of the same material, with the center ring representing the governing board with full control for the major policy implementation. That is followed by the executive director and her or his staff with the everyday operation of 1) the Centers of Excellence, followed by, II) the National Dissemination and Information Network, which is then followed by, III) the ongoing national and regional committees. The information is then usable by the targeted clients: special needs individuals in the elementary, secondary and post secondary institutions, as well as the home, public libraries, hospitals and other public and private institutions.

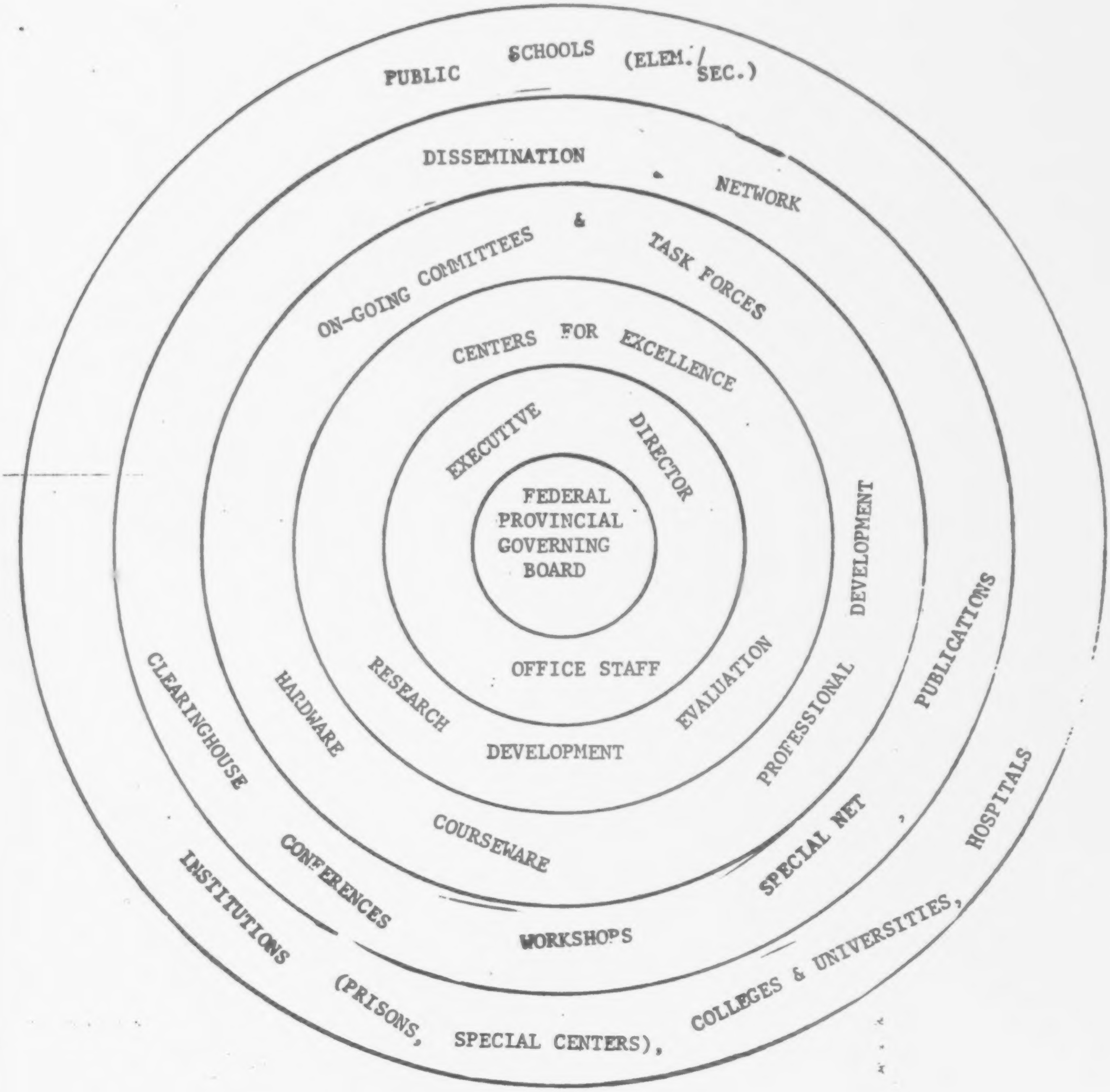
The predicated costs of this national policy is approximately eight million dollars per annum for the organization represented in Figures three and four. The remainder of this chapter will discuss in much greater detail the implementation policy on a step-by-step basis as represented in Figure 3.

FEDERAL/PROVINCIAL GOVERNING BOARD

The funding of this board, as well as the constitution of its committee, will be shared by the federal government and the respective provincial governments that agree on the implementation of this report and their provinces

Figure #4

ORGANIZATION OF NATIONAL POLICY/PLAN
THE LOCUS OF CONTROL


PUBLIC SCHOOLS (ELEM./SEC.)
DISSEMINATION NETWORK
ON-GOING COMMITTEES & TASK FORCES
CENTERS FOR EXCELLENCE
EXECUTIVE DIRECTOR
FEDERAL PROVINCIAL GOVERNING BOARD
OFFICE STAFF
RESEARCH
EVALUATION
DEVELOPMENT
HARDWARE
COURSEWARE
PROFESSIONAL DEVELOPMENT
CLEARINGHOUSE
CONFERENCES
WORKSHOPS
SPECIAL NET
PUBLICATIONS
INSTITUTIONS (PRISONS, SPECIAL CENTERS), COLLEGES & UNIVERSITIES, HOSPITALS

respective involvement. It is proposed that in the first three years of funding that the federal government will pay for 70% of the costs and that the respective provincial governments should cover the remaining 30%. In year four and five, the cost shared arrangements will be 50% federal and 50% provincial, with the arrangements for a possible year six and seven being determined in year four by the governing board. Thus in year one through three, the federal government will be funding approximately 5.6 million dollars per annum, while the provincial governments will be funding 2.4 million dollars per annum. In years four and five, the federal government will be funding 4 million dollars a year, while the provincial governments will be providing the remaining 4 million dollars per year. The total costs for the federal government over the initial five years will be approximately 20.8 million dollars and the costs for all the involved provincial governments will be 15.2 million dollars.

The composition of this board will be made up of representatives from both provincial and federal governments. It is suggested, although not stated, that the federal representatives may come from the Department of Communications, Secretary of State, Employment and Immigration and Health and Welfare. The provincial representatives will more than likely come from the Ministries of Education and Advanced Education, although it would be quite appropriate to have representatives from the

Ministries of Community Services and Corrections, Health, and Labour and Manpower. The composition of the board will consist of no less than seven individuals, with 4 provincial and 3 federal representatives and no more than 13 individuals, with 7 provincial and 6 federal representatives. This board would probably meet every three months with the executive director and also with representatives, if need be, from the Centers of Excellence as well as the three working committees: hardware, courseware/software and professional development.

EXECUTIVE DIRECTOR AND STAFF

The Executive Director will be hired by the board in order to administer and monitor the three major thrusts of the board, namely, the centers, dissemination and committees. The Director should have a broad experiential background in the area of computer applications to education and training and should, if possible, have experience in working with special needs individuals. The research officer should have expertise in technology and its applications to education and training and should be aware of and have experience in evaluation and research in this area. The other staff member should be an administrative secretary who should be able to take care of the every day running of the office when the director and research officer are out in the field. The location of the office has not been suggested, although it would make sense to have it located at one of the Centers of Excellence for financial and other practical reasons.

****The basic annual costs for running this office would be approximately $135,000 for staff, and another $50,000 for office rental supplies, phone, and travel, etc.****

1) Centers of Excellence for Research/Development and Evaluation.

The centers that will be discussed in the next part of this report are interdisciplinary in that some are located at universities, some at special schools, ministries of education, hospitals and other federal and provincial institutions.

A. British Columbia

One of the principal training programs for the hearing and visually impaired is located at the University of British Columbia, Faculty of Education where most of the teachers and other related professionals receive their training in Western Canada. There is also considerable research going on for the hearing impaired at the University of Victoria by Conway and others. Research into the uses of hardware with the physically handicapped is being carried out by Dumper and his colleagues in the city of Vancouver. It is proposed that federal/provincial cost sharing be awarded to the aforementioned individuals and their respective institutions to carry out courseware development, research and evaluation on its use for the hearing impaired and the visually impaired. These institutions have the pedagogical expertise since they are involved in research and curriculum development in this area. They also have the field sites that can be used for the initial research and evaluation of their courseware products. Research should also be carried out with Dumper and his colleagues by field testing and evaluating the courseware and hardware that is being carried out at the other national centers, such as those explained in later sections of this report in Ontario and Manitoba. The Ministry of Education, Special Education Branch, along with the Deputy Minister of Education should be involved in all of the distribution of funds to be provided, as they have demonstrated in correspondence to this researcher.

****The Federal/Provincial cost shared funding will be approximately one million dollars per annum for staff, space, equipment, office expenses and travel, etc.****

B. Alberta

In Alberta there has been considerable research and evaluation of courseware that has implications for a national policy for special needs individuals. The

University of Calgary Computer Applications to Education Unit in the Faculty of Education, for the past 15 years (Hallworth, Brebner and Brown) have been involved in the research and development of courseware and special terminal facilities for the developmentally handicapped both at the V.R.R.I. and the public school system. The University of Alberta, Educational Psychology Department has also been involved with Mulcahy and his colleagues, looking at special needs individuals and the implication for assessment and reading skills. The major evaluation center and clearing house for educational courseware and software in Canada has been through Thiessen and Wightman at the Computer Technology Project of the Alberta Ministry of Education. It has been the major center for this type of information, with its only international rival being the Micro-Sift Clearinghouse affiliated with North West Regional Labs in Portland, Oregon.

****It is recommended that the Alberta Clearinghouse through the Alberta Ministry of Education and Advanced Education become the National Evaluation Center, Clearinghouse, and Distribution Network. The costs of operating this center would be approximately $750,000 per annum for staff, office expenses, rental, hardware, travel and other related costs. There should also be $250,000 per annum to the Computer Applications Unit at the University of Calgary to continue with their courseware and terminal research with the developmentally handicapped. The Educational Psychology Department at the University of Alberta should be provided with $100,000 per annum to continue with their research for special needs individuals in the area of assessment and reading.****

C. Saskatchewan

In Saskatchewan the major interest in Computer Applications for Special Needs Individuals has been in two places: one being at the University of Saskatchewan with Colburn and McLeod, and the other by Zimmer, who is Executive Director of The Sheltered Workshop System of 32 settings in Saskatchewan.

****It is recommended that $500,000 per annum be assigned to research and development of courseware for special needs adults who are in the Sheltered Workshop Setting in the area of cognitive, vocational and behavioral life skills. It would be hoped that this research would use the resources mentioned above at the University of Saskatchewan, in the establishment of their research program.****

D. Manitoba

In the province of Manitoba, the University of Manitoba has been involved in the coordination of an eleven year joint research project entitled The Manitoba Computer Assisted Learning Consortium. The major funding agencies in the consortium include the Manitoba Department of Education, the Department of Community Services and Corrections, 20 Manitoba School Divisions, The Federal Government through Work Study programs for university students and The University of Manitoba. The consortium is involved in the research and development, and evaluation of courseware in use in 250 Manitoba schools for the support of programs for special needs students, as well as the regular school program. This courseware has been developed for a CDC mainframe computer as well as the Apple, Pet, and Radio Shack microcomputer systems.

****It is recommended that the consortium in coordination with all of its school, government and institutional members, continue in the development of courseware for special needs individuals, most of whom have been integrated into the mainstream of education and training. This would also include some of the special programs such as Prince Charles School (developmentally handicapped), The Manitoba School For the Deaf and the Lord Roberts school program (physically handicapped). There should also be continued research involved with those who are culturally disadvantaged - many of whom are now in the Manitoba Youth Center (juvenile corrections) and also the provincial and federal penitentiary services. The projected costs of this venture would be approximately one million dollars per annum to cover staff, office related expenses and travel, etc..****

E. Ontario

In the province of Ontario over the past 14 years, there have been many provincial, and university and college initiatives into the area of computer based education. The Ontario Institute for Studies in Education (O.I.S.E.) has been involved, through Olivier, with the development of courseware for upgrading purposes at the community college and high school level, as well as courseware for other subject areas such as nursing, electricity and accounting, etc. At Queen's University, Burnett and Higginson have been involved in a major evaluation of LOGO in the elementary school environment, especially with low vs. high achieving students. The National Research Council of Canada (NRC) has been involved in their Medical Rehabilitation division with Nelson and others on the integration of computer and microcomputer hardware with the physically handicapped. The Ontario Center for Crippled Children through the Augmentative Communication Unit with Parnes and colleagues, as well as McNaughton and colleagues in the Blissymbolics Communication Unit, have been involved in the development of hardware and courseware for those with physical and developmental handicaps. Lastly, the Ministry of Education through Smith and his colleagues at the Computer in Education Support Division have been involved in the development of educational standards for a Canadian developed and produced microcomputer which has many features such as sound and a track ball that can be used with special needs individuals. In fact, the Ontario government through Smith et al have just released a call for courseware development for this particular Canadian produced micro that includes 10 million dollars in funding over the next two years with approximately one million of that funding targeted to the special needs student.

****It is recommended that several grants be allocated to those above mentioned units in support of continued research, development and evaluation in this area; $200,000 should go to Queen's for continued research with LOGO and the special needs individual. Another $500,000 should go to OISE and Olivier and his group for courseware development with the adult special needs individual in the college system, and for training programs as well as the continued research and development of courseware incorporating the laser video disk system. The NRC program in Ottawa and the Ontario Crippled Children's Center's programs should receive $500,000 for a cooperative venture on hardware and courseware development for the physically handicapped (with it probably broken down to $200,000 per annum for NRC and $300,000 per annum for the Ontario Center for Crippled Children). It should be noted that the

Executive Director of this program should keep close liaison with Smith and his colleagues in order to monitor the developments of Ontario's hardware and courseware initiatives, and that the national rights to the hardware and courseware developments should be acquired by the governing board for all of the provinces and territories in Canada, if at all possible.****

F. Quebec

In the province of Quebec, there has been little reported research in the area of computer applications to education for special needs individuals. There has been active research in the development of computer applications to teaching and training with Cartwright at McGill University and Boyd and Mitchell, et al, at Concordia University. Gollick at McGill has been involved in developing Logic games for children with learning problems, and Perusse and Stolovich at the University of Montreal have been involved locally and nationally on setting policies in the area of computer based education and training. Shore at McGill has discussed the potential of using computers with the gifted individual based on their experience within the Ph.D. program in Gifted Education. Lastly, the Ministry of Education staff who has been most involved with this interchange of information in the computer courseware area is Louise Dubec, who also represents Quebec's interests on the NRC subcommittee along with Stolovitch from Montreal.

****It is recommended that one million dollars be assigned for research and development in the area of computer courseware development for special needs individuals in Quebec. Some of these funds should be targeted to McGill - namely $250,000 for the development of courseware for the gifted to be developed in both French and English. The remaining $750,000 may be distributed to the individuals mentioned above or others with the approval of the Quebec Ministry of Education deciding on where the priority areas are. It would be assumed that the Quebec Government may want to translate courseware developed in the other provinces under the funds provided in this report, or the other provinces may want to rewrite the original courseware developed in Quebec.****

G. Maritimes, Territories and Others

There has been no specific funds allocated to the Maritimes and the Territories due to the fact that no correspondence was received regarding their direct or indirect research in the area of computer assisted learning, or courseware in this domain. However, it is felt that 1.7 million dollars (counting both federal and provincial contributions) should be set aside for requests and proposals that come in from the Maritimes and the Territories to develop research and evaluation programs in the area of courseware development with special needs individuals. The 1.7 million dollars and any other residuals, should also be made available (within limits to those provinces already mentioned in the proposed funding) in case there are further proposals or extension of programs which the board, along with the Executive Director would approve. Thus the 1.7 million dollars per annum under this section would be used to fund projects that have not been perceived or developed at this point in time.

II. NATIONAL DISSEMINATION AND INFORMATION NETWORK

A. Alberta Clearinghouse, Evaluation and Distribution Center

Information regarding the funding and operation of this center has already been discussed in Section I(B) of this chapter. It should be reiterated that this center will be the main clearinghouse for the courseware and research and evaluation of this courseware for Canada. It is expected that all of the centers will focus their reports and courseware products for further distribution to the other agencies, institutions and networks described in other sections of this chapter. The software that is collected, and the related documentation and research reports, would be made available at cost through regional distribution units in each province after it is collated and distributed by the national clearinghouse. These regional centers would be at Provincial Departments of Education and advanced education media and library distribution centers, as well as public libraries and their related media service centers. These materials would be released for the costs of materials, plus labour, for the preparation of the electronic media and printed documentation and user guides.

B. National Conference

There should be a National Conference each year for the first three years, organized by the Executive Director in coordination with the expertise at the proposed centers and other government and private sector agencies. This conference will bring together those in Canada who are carrying out research and development in the use of computer courseware for the education and training of special needs individuals, and will help in the sharing of information and implementation strategies. The location and time of such a conference shall be chosen by the board in consultation with the Executive Director. The board should subsidize up to $20,000 the costs of the conference through the administration, but it is highly likely that said conference should at least break even if a reasonable registration of $125 is charged for a three day conference.

C. Regional Conferences

It is expected that the majority of individuals who are working with special needs individuals will not be able to attend a national conference due to the limited travel funds in some regions, as well as their related professional responsibilities. Individuals such as resource teachers, physiotherapists, occupational therapists, workshop counsellors, parents and even the special needs individuals themselves would benefit if they could attend a modified version of the national conference on a regional level. It is proposed that one regional conference be in (British Columbia and Alberta), (Saskatchewan, Manitoba and Northwest Ontario), (Central Ontario and Quebec) and the (Maritimes). The Northwest Territories and the Yukon would participate in one of the western regional conferences. The board should subsidize, if necessary, costs up to $10,000 for each of the regional conferences, although it is likely that they should be able to break even. The organization of these conferences would be the responsibility of the Centers of Excellence in the various regions in coordination with the Executive Director of the board.

D. General and Specific Workshops

It is expected that each Center of Excellence will be responsible for the preparation and documentation of three half-day or full-day workshops that can be delivered in the field. It should be expected that the costs of the professional workshop or inservice staff are covered in the yearly allocation of funds to the center. It is expected that these workshops or inservices could and would be available on request to any jurisdiction in Canada if time and staff allocation permits. Furthermore, it is expected that the unit requesting the workshop or inservice would be responsible for the travel costs as well as living expenses while the session is being given, but the personnel costs are incorporated into the centers initial budget line.

E. National Newsletter

The Executive Director should be responsible for the organization of a national newsletter that will be free to all subscribers in Canada for the first year in order to develop as wide a readership as possible. Each center will be responsible for an update in each issue, overviewing their developments over the last month or two months. Articles and other correspondence should be widely solicited on a national basis. It is hoped that for the first six months, three issues would come out on a bimonthly basis and then on a monthly basis indefinitely. The costs for this journal will be covered by the addition of $20,000 to the Executive Director's budget and that after the first year the costs should be completely covered by subscriptions (probably $20 per annum).

F. Canadian "Special Net"

In Chapter One there is a brief overview of the use of an electronic bulletin board service known as "Special Net" in the United States, which is funded by the Federal Government and State and local subscriptions. It is recommended that the Executive Director purchase the licensing rights to the U.S.A. "Special Net" information data bases, and that this system be implemented in coordination with Ontario's information data base and bulletin board service titled "ONTERIS". The use of this service would be on a subscription basis similar to the one established in the U.S.A., with local nodes in each province connected by data pac to central and other network facilities. It is important that the National Clearinghouse in Alberta should work closely with "ONTERIS" in order to make their information and updates of services, courseware, and documentation available in an electronic format for the network operation. The yearly costs would be the acquisition of the licensing rights to the U.S.A. "Special Net" data base. No fee schedule is available at this time.

G. Private Sector Involvement

Courseware and its related hardware that is developed by the Centers of Excellence would be distributed at cost of duplication, as mentioned in A. of Section II, by the National Clearinghouse in Alberta. Thus the products of these centers would be free to all residents of Canada for the cost of duplication. However, for outside of Canada, mainly Europe, the U.S.A., and the remainder of the English and French speaking world, the distribution and marketing would be carried out by Canadian private sector companies. The board would put the courseware and related hardware up for bids to the private sector for the packaging and marketing outside of Canada. A share of the royalties would be coming back to the governing board who would disseminate the funds, if available, back to the running of the Executive Director's office and the three major thrusts of this report.

III NATIONAL AND REGIONAL ONGOING COMMITTEES AND/OR TASK FORCES

It is recommended that ongoing committees should be established, made up of individuals from the Centers of Excellence, as well as one or two members at large recommended by the board.

A. HARDWARE - This committee will look at the implications of present and future microcomputer based hardware developments and their related peripherals, and other input/output devices. This includes single switch devices, video disk units, digitized and synthesized speech, plus other devices which we cannot even envision at this point in time.

B. COURSEWARE - The next committee will address the area of courseware development and focus in on instructional design issues, the use of or non-use of graphics, authoring languages, resource support materials, etc. This committee would also address the issue of evaluation and research regarding the changes in cognitive, affective and psychomotor development through the use of the centers' courseware and related hardware developments.

C. PROFESSIONAL DEVELOPMENT - The last committee would address the professional development issues arising from the implementation on a national scale of the courseware and related hardware developed at these centers. Many of these concerns and implementation strategies are addressed under Section II of this chapter on a National Dissemination and Information Network. Professional development needs would take into account professionals such as teachers, nurses, occupational and physio-therapists, counsellors, etc., and other non-professional staff who are involved in hospitals, schools, institutions and the home.

These committees should meet at least twice a year in order to review the developments of the various centers over the period of the year, and thus their recommendations regarding the research, and development and evaluation of the courseware and related hardware initiatives should then be referred back to the board, and the Executive Director for the following years planning. These committees would probably meet twice a year and rotate the meeting locations between the different Centers of Excellence, with the travel costs already built into each centers' budget allocation for their individual staff. It was mentioned in discussion with representatives from provincial governments that one private sector individual from an industry related to that committee be a working member of the committee. This writer can see both good and bad implications of such an addition, but would recommend that the board consider such a request.

SUMMARY

In Table 3 , there is a summary of the financial implications of this report on a per annum basis and also on a five-year plan basis. The yearly costs of eight million dollars and the five year costs of 40 million dollars may seem significant especially when taken from the perspective of an area where little funds have been allocated in the past for computer applications to education and training, with or without the added responsibility of special needs individuals. And when the outcomes of these strategic funding mechanisms, elaborated on in Chapter 5, are looked at in comparison to the amount of spending that occurs provincially and federally for special needs individuals, (which by Manitoba's account

TABLE 3

FIVE YEAR FINANCIAL PLAN FOR THE FEDERAL IMPLEMENTATION OF RECOMMENDATIONS IN CHAPTER 5 FOR "AN OVERVIEW AND PLAN FOR THE CANADIAN IMPLEMENTATION OF COMPUTER ASSISTED LEARNING COURSEWARE FOR SPECIAL NEEDS CHILDREN, ADOLESCENTS AND ADULTS"

	(70% Federal 30% Provincial)			(50% Federal 50% Provincial)		
EXPENSES	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
CENTRES OF EXCELLENCE & RESEARCH/DEVELOPMENT & EVALUATION						
British Columbia Projects	$1,000,000	$1,000,000	-	-	-	$ 5,000,00
Alberta Projects	1,100,000	1,100,000	-	-	-	5,500,00
Saskatchewan Projects	500,000	500,000	-	-	-	2,500,00
Manitoba Projects	1,000,000	1,000,000	-	-	-	5,000,00
Ontario Projects	1,200,000	1,200,000	-	-	-	6,000,00
Quebec Projects	1,000,000	1,000,000	-	-	-	5.000,00
Maritimes, Territories & Others	1,700,000	1,700,000	-	-	-	8,500,00
SUB TOTALS	$7,500,000	$7,500,000	-	-	-	$ 37,500,00
NATIONAL DISSEMINATION & INFORMATION NETWORK						
Alberta Clearinghouse	0 acct.above	0 acct.ab.	0 acct.ab.	0 acct.ab.	0 acct.ab.	0
National Conferences	20,000	20,000	20,000	20,000	20,000	100,00
Regional Conferences	40,000	40,000	40,000	40,000	40,000	200,00
Workshops	0	0	0	0	0	0
National Newsletter	20,000	0	0	0	0	20,00
Canadian "Special Net"	10,000	10,000	10,000	10,000	10,000	10,00
SUB TOTALS	90,000	70,000	70,000	70,000	70,000	370.00
ONGOING COMMITTEES						
Hardware	5,000	5,000	5,000	5,000	5,000	25,00
Courseware	5,000	5,000	5,000	5,000	5,000	25,00
Professional Development	5,000	5,000	5,000	5,000	5,000	25,00
SUB TOTALS	15,000	15,000	15,000	15,000	15,000	75,00
ADMINISTRATION						
Board	100,000	100,000	100,000	100,000	100,000	500,00
Executive Director & Office Staff	185,000	195,000	205,000	215,000	225,000	1,025,00
Other	110,000	120,000	110,000	100,000	90,000	530,00
SUB TOTALS	395,000	415,000	395,000	415,000	415,000	2,055,00
TOTALS	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$40,000,00

alone runs into a 40 million dollar a year operation), the then proposed funding is insignificant by comparison. Also when we look at the massive federal and provincial policies and funds being made available in the technology and related microcomputer based areas, such as those elaborated on in Chapter 1, these proposed funds are very much in line with other national and provincial projects in the technology related disciplines.

In conclusion, if this report is accepted, even if in principal only, it will add so greatly to the "spirit" and educational and vocational opportunities of Canadas' special needs individuals.

THANK YOU.

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APPENDIX A

COMPUTER TECHNOLOGY FOR THE HANDICAPPED IN SPECIAL EDUCATION AND REHABILITATION

APPENDIX A

COMPUTER TECHNOLOGY FOR THE HANDICAPPED IN SPECIAL EDUCATION AND REHABILITATION

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APPENDIX B

TECHNOLOGY IN SPECIAL EDUCATION CONFERENCE
RENO, NEVADA - JANUARY 1984

APPENDIX B

TECHNOLOGY IN SPECIAL EDUCATION CONFERENCE
RENO, NEVADA - JANUARY 1984

Professional Development Planning Guide

For your convenience, sessions have been classified below according to programmatic area.

Administration/Management
TH-5, TH-7, TH-8, TH-9, TH-14, F-6, F-8, F-9, F-13, F-15, F-18, F-19, F-22, F-25, F-32, F-36, S-4, S-5, S-7 S-12, S-20, S-24

Computer Assisted Instruction
TH-2, TH-6, TH-12, TH-13, F-1, F-5, F-11, F-14, F-15, F-16, F-17, F-20, F-23, F-26, F-29, F-33, F-35, S-1, S-2, S-9, S-25

Computer Managed Instruction
TH-3, TH-9, F-1, F-11, F-15, F-23, F-24, F-26, F-38

Curriculum Development
TH-3, TH-6, TH-7, F-1, F-16, F-17, F-21, S-3, S-14, S-25

Evaluation/Assessment
TH-12, TH-13, TH-14, F-8, F-19, F-22, F-24, F-26, F-37, S-4, S-5, S-22

Hardware
TH-10, F-7, F-14, F-34, S-6, S-15, S-18, S-21, S-23

Individualized Student Planning (IEP's)
TH-8, TH-9, TH-14, F-6, F-13, F-19, F-22, F-23, F-24, F-31, F-36, S-4, S-5, S-24

Inservice/Preservice
TH-5, TH-6, TH-14, F-1, F-3, F-11, F-13, F-17, F-23, F-28, F-30, F-33, S-10

Networks
TH-5, TH-14, F-22, F-26, S-7, S-18

Policy and Finance
TH-5, TH-7, F-2, F-4, F-8, F-18, S-12

Research
TH-12, F-4, F-8, F-10, F-16, F-17, F-21, F-23, F-24, F-29, F-33, F-37, S-9, S-16

Software
TH-3, TH-4, TH-7, TH-12, F-3, F-5, F-7, F-11, F-14, F-15, F-16, F-18, F-20, F-21, F-29, F-31, F-34, S-10, S-12, S-14, S-17, S-21

Telecommunications
F-27, S-6, S-8, S-18

Transportation
TH-5, F-8, F-32

Videodiscs
F-16, F-24, S-6

Sample Courses of Study

Following is a set of objectives abstracted from presentation descriptions and organized for three different target groups and two levels of expertise. Selected are a set of suggested sessions and session options that relate to these objectives. To use this information as a guide to the conference, we suggest that you find your target group and level first, decide which objectives meet your personal expectations and/or the need of your organization, then select the sessions of most interest to you.

Target Group: Higher Education
User Level: Potential and Beginning

1. Participants will become familiar with the use of telecommunication systems and devices to access research tools and data banks.
   TS-2, F-27, S-8, S-18
   Alternative: S-7
2. Participants will gain awareness of computer courseware available for training the special educator to utilize the computer in the classroom.
   W-2, Th-4, TH-14, F-3, F-11, F-26, F-30, S-19
   Alternatives: S-14, S-22, UG-7
3. The participants will gain increased aware-

ness of and experience with computer software programs and their use as instruction devices in the special education classroom.
W-7. F-2. F-17. F-24. S-2. S-25
Alternative: F-20

4. Participants will gain insight as to how the computer can assist in the management of special education programs by providing decision making support.
W-5. TS-1. TH-5. F-13. F-32
Alternatives: W-4. TS-2

Target Group: Higher Education
User Level: Intermediate Advanced

1. Participants will gain awareness of computer courseware available for training the special educator to utilize the computer in the classroom.
W-7. UG-7. TH-4. F-5. F-11. F-30
Alternatives: UG-2. F-28. F-38

2. The participants will gain increased awareness of and experience with computer software programs and their use as instruction devices in the special education classroom.
W-7. TH-11. F-2. F-15. F-29. S-16
Alternatives: F-1. F-22

3. Participants will be exposed to models that provide useful, research based information to assist administrators and educators in the use of computers for special education programs.
TH-12. F-2. F-33
Alternatives: F-37. F-4

Target Group: Administrators
User Level: Potential and Beginning

1. Participants will be aware of guidelines for purchasing hardware and software for program improvement.
UG-5. F-4. TS-4
Alternatives: F-20. F-25

2. Participants will become familiar with telecommunication function and the advantages to having data bank access.
TS-2. F-27. S-7. S-18

3. Participants will understand how computers can assist in the management of special education programs.
W-4. TH-7. F-9. F-22. S-5. S-19
Alternatives: TS-1. TS-4. TH-5. S-20

4. Participants will have an increased understanding of how the computer can aid in the IEP process.
TH-8. F-6. F-19. F-31
Alternatives: TH-14. F-36

Target Group: Administrators
User Level: Intermediate and Advanced

1. Participants will understand how software programs will aid the special education administrator with finance and financial policy.
W-5. TS-3. F-18. S-12
Alternative: F-8

2. Participants will have an increased understanding of how the computer is an aid in the formulation of IEP's and the measurement of IEP's.
W-6. UG-2. S-24

3. Participants will gain an insight as to how the computer can assist in the management of special education programs by providing decision making support.
W-4. TS-1. TH-5. F-32
Alternatives: W-5. TS-2. F-13

4. Participants will be aware of how software can be used as an instructional aid.
W-7. TH-11. F-2. F-15. F-29. S-16
Alternatives: F-1. F-21

Target Audience: Teachers
User Level: Potential and Beginning

1. Participants will gain an increased awareness of and experience with microcomputer use and computer software selection for K-12 classroom instruction and vocational/career programming.
W-3. TH-7. TH-13. F-20. F-23. F-29. S-21

2. Participants will gain an awareness of and or experience with computer courseware available for IEP development, construction of classroom tests, test analysis, and report writing.

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UG-6. TH-14. F-26. F-38. S-19
Alternatives: UG-2. S-22. S-14

3. Participants will gain an increased awareness of and experience with computer software programs for use in classroom instruction and planning for LD. EMH. and Bilingual students focusing on language arts. math. and writing.
   W-1. TH-3. F-1. F-17. F-24. F-35. S-1. S-25
   Alternatives: F-16. S-11

Target Group: Teachers
User Level: Intermediate. Advanced and Special Areas

1. For teachers of the severely handicapped. The participants will gain an increased awareness of and experience with hardware adaptations for microcomputers which will aid these children in communication and mobility.
   W-3. UG-5

Physically Handicapped: TH-10. F-34. S-23
Multiple Handicapped: TH-10. F-14
Autistic: S-9
Communication Disorders: F-14. F-29. F-38. S-18

2. For teachers of visually impaired. Participants will gain an increased awareness of and experience with microcomputers for material preparation using special devices for braille and other aids.
   W-3. TH-6. F-7. F-14. S-15
   Alternative: S-23

3. Participants will gain an increased awareness of and experience with developing instructional courseware for individualized classroom instruction.
   W-7. UG-3. TH-4. F-5

4. Participants will gain an increased awareness of current research. and experience with courseware for use in instructing gifted. LD. and EMH children in the areas of written expression. thinking. and problem solving skills.
   TH-3. F-21. S-3
   Alternatives: TH-11

5. Participants will gain an increased awareness of the federal role and current research as it relates to technology activities which focus on individualized instruction and compensatory aides.
   F-2. F-37
   Alternative: F-33

Topical Seminars

No.	Title	Day	Time	Place	Leaders
TS1	Data Base Management	Thursday	1:30-4:00 p.m.	Goldwyn	*Michael Tracy*, Associate Professor and Associate Director of Developmental Training Center, Indiana University *Jim Johnson*, Special Education Director, Elk Grove Unified School District, Elk Grove, CA
TS2	Networking	Thursday	1:30-4:00 p.m.	Mayer	*Jerry Olson*, Associate Director of the Office of Instructional Computing, Indiana University
TS3	Spreadsheets	Friday	8:30-11:00 a.m.	Metro	*Jim Johnson*, Special Education Director, Elk Grove Unified School District, Elk Grove, CA. *Michael Tracy*, Associate Professor and Associate Director of Developmental Training Center, Indiana University
TS4	Hardware Considerations	Friday	1:30-4:00 p.m.	Bijou Century	*H. Edward Cocks*, Educational Consultant, Citadel Systems, Tallahassee, FL

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APPENDIX B

TECHNOLOGY IN SPECIAL EDUCATION CONFERENCE
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SESSIONS & SESSION LEADERS:

Allard, Kim - Computer Resources for the Special Educator - The SECTOR Project. Program Area: Hardware, Software. Exceptionality: All.
*SESSION: S-21.

Bailey, Don - Goal Attainment Scaling: An Evaluation System and Microcomputer Program for Measuring Progress in Special Education. Program Area: Administration/Management, Evaluation, Individualized Student Planning, Software. Exceptionality: Cross-Categorical.
*SESSION: F-19.

Baskin, Barbara - Raising the Performance Levels of Mildly Handicapped Students on Standardized Math Tests Using Computer Assisted Instruction. Program Area: Computer Assisted Instruction, Computer Managed Instruction, Curriculum Development, Teacher Preparation, Software. Exceptionality: Educationally Handicapped.
*SESSION: F-1.

Behrman, Mike - Environmental Control: Selecting and Training Multi-Handicapped Individuals. Program Area: Research, Environmental Control. Exceptionality: Multiply Handicapped.
*SESSION: F-10.

Bennin, John - The Talking Wheelchair. Program Area: Software. Exceptionality: Physically Handicapped, Speech Impaired.
*SESSION: F-34.

Blaschke, Charles L. - New Directions in Courseware/Software: Development and Adaptation. Program Area: Computer Assisted Instruction, Computer Managed Instruction, Administration/Management. Exceptionality: All.
*SESSION: F-15.

Brown, Gerri - Presceiption for Computing Success: Knowledge and Self Awareness. Program Area: Computer Assisted Instruction. Exceptionality: Mentally Retarded, Emotionally Disturbed, Learning Disabled.
*SESSION: TH-2.

Browning, Phillip - A New Instructional Technology to Enhance Transition from School to Community for Mildly

Mentally Handicapped Individuals. Program Area: Curriculum Development, Computer Assisted Instruction, Videodiscs/Videotape, Research, Software. Exceptionality: Mildly Mentally Retarded.
*SESSION: F-16.

Brunken, Phyllis - Utilization of Microcomputer Technology by the Visually Handicapped User. Program Area: Computer Assisted Instruction, Curriculum Development, Teacher Preparation. Exceptionality: Visually Impaired/Blind.
*SESSION: TH-6.

Cain, Edward J., Jr. - Help for the Administrator - Decision Making for the Implementation of Computer Systems in Schools. Program Area: Administration/Management. Exceptionality: All.
*SESSION: S-25.

Campbell, Robert - SPECIALNET: An Application of Computer Assisted Telecommunications in Special Education Information/Resource Management. Program Area: Telecommunications.
*SESSION: F-27.

Craighead, Donna - Word Processing for the Gifted. Program Area: Language and Writing Development, Creative Expression. Exceptionality: Gifted.
*SESSION: S-11.

Crowley, Patricia A. - Special Education Information Management Systems (SEIMS). Program Area: Administration/Management, Individualized Student Planning. Exceptionality: All.
*SESSION: F-6.

Crowner, T. Timothy - How Are We Really Using Micros? Program Area: Research. Exceptionality: All.
*SESSION: S-16.

Donahue, Mike - Special Educators and Vendor Expedition: Findings and Products. Program Area: Administration/Management, Evaluation, Individualized Student Planning, Networks.

Edminster, Patricia - Time Saver of the Future-Mainframe Computer Assisted IEP's and Data Management Systems. Program Area: Administration/Management, Individualized Student Planning, Hardware. Exceptionality: All.
*SESSION: S-24.

Fitch, James L. - Computer Managed Services for Communication Disorders. Program Area: Computer Managed Instruction. Exceptionality: Communication Disorders.
*SESSION: F-38.

Fusco, Carol B. - Access to Computers for the Severely Physically Handicapped. Program Area: Hardware. Exceptionality: Severely Physically Handicapped.
*SESSION: TH-10.

Gall, Robert - Developing Computer Literacy in Preservice Teacher Training: An Objective Analysis of One University's Experience. Program Area: Teacher Preparation. Exceptionality: All.
*SESSION: F-30.

Galvin, Walter J. - Introduction to the Use of Microcomputers in the Special Education Classroom. Program Area: Teacher Inservice, Computer Assisted Instruction, Computer Managed Instruction, Software, Individualized Student Planning, Research. Exceptionality: All.
*SESSION: F-23.

Gambino, Thomas - Microcomputer-Based Tools for Special Education Planning and Administration. Program Area: Administration/Management, Software, Policy and Finance.
*SESSION: S-12.

Gander, Sharon L. - Education Management Through Software Applications. Program Area: Administration/Management, Curriculum Development, Finance.
*SESSION: TH-7.

Hanley, Tom V. - Microcomputers in Special Education Highlights of Current Research. Program Area: Administration/Management, Computer Assisted Instruction, Research, Teacher Inservice. Exceptionality: All.
*SESSION: F-33.

Hasselbring, Ted S. - AIMSTAR: A Data Management and Decision-Making System for Teachers of the Handicapped. Program Area: Computer Managed Instruction. Exceptionality: Moderately and Severely Mentally Retarded.
*SESSION: S-19.

Hofmeister, Alan - Debriefing of Dr. Hofmeister's General Session Address.
*SESSION: TH-1.

Huenergard, Cliff - A Computer Application for Severely Handicapped Children. Program Area: Hardware. Exceptionality: Physically Handicapped.
*SESSION: S-23.

Jamieson, Janet D. - Leadership Training for Administrators of Special Education in Emerging Technology: A Project Overview. Program Area: Administration/Management, Networks, Transportation, Policy and Finance, Inservice/Preservice. Exceptionality: All.
*SESSION: TH-5.

Karnes, Merle B. - Research on the Psychoeducational Effects of LOGO and Assorted Software/Courseware for Preschool Exceptional Children. Program Area: Computer Assisted Instruction, Evaluation, Research, Software. Exceptionality: Gifted, Mildly and Moderately Handicapped.
*SESSION: TH-12.

Kosberg, Bernard - Identifying School Behavior Problems: Techniques, Interventions, Strategies. Program Area: Administration/Management, Evaluation, Individualized Student Planning, Teacher Preparation. Exceptionality: Emotionally Disturbed, Neurologically Impaired, Learning Disabled.
*SESSION: TH-14.

Krolick, Bettye - Microcomputer Hardware and Software for Braille Applications. Program Area: Software, Hardware. Exceptionality: Visually Impaired.
*SESSION: F-7.

Lewis, Rena - Telecommunication Devices as Research Tools: Accessing Mainframes, Bibliographic Data Banks, and Electronic Bulletin Boards. Program Area: Telecommunications. Exceptionality: All.
*SESSION: S-8.

Littleton, Denise M. - CAI and Special Education Teacher Preparation. Program Area: Computer Assisted Instruction, Computer Managed Instruction, Teacher Preparation. Exceptionality: Mental Retardation.
*SESSION: F-11.

Lukenbill, Ron - Kids, Computers and Competence: How to Train Others. Program Area: Inservice/Preservice. Exceptionality. All.
*SESSION: S-10.

Maloney, Michael - Mighty Math-Prototype of an Interactive Educational Software System. Program Area: Computer Assisted Instruction, Computer Managed Instruction, Evaluation. Exceptionality: Mildly Handicapped.
*SESSION: S-1.

Mason, Marguerite - Using Microcomputers with LD and EMR Students. Program Area: Computer Asisted Instruction, Teacher Inservice, Software, Curriculum Development, Research. Exceptionality: Learning Disabled, Educable Mentally Retarded.
*SESSION: F-17.

McCarthy, James - Helping the Visually Impaired Student with Electronic Video Visual Aids. Program Area: Hardware. Exceptionality: Visually Impaired.

McClellan, Elizabeth - Project RETOOL: Training Special Education Teacher Educators in Microcomputer Applications. Program Area: Teacher Inservices and Preservice. Exceptionality: All.
*SESSION: F-28.

Middleton, Teresa - DEAFNET-Helping the Hearing Impaired Lead the Way in a Communication Society. Program Area: Networks, Telecommunications. Exceptionality: Hearing Impaired.
*SESSION: S-18.

Miller, Earle L., Jr. - Microcomputer Management of Special Education. Program Area: Administration/Management, Individualized Student Planning.
*SESSION: TH-8.

Milone, Michael N., Jr. - Authoring Systems: their Application in Special Education. Program Area: Software. Exceptionality: All.
*SESSION: TH-4.

Morin, Alfred J. - Technology Trends and New Special Education Applications: An Overview Update. Program Area: Microcomputers, Telecommunication, Videodiscs, Software, Hardware. Exceptionality: All.
*SESSION: S-6.

Nelson, Carolyn Spearman - Using the Computer to Write an Individualized Educational Program. Program Area: Individualized Student Planning, Software, Administration/Management. Exceptionality: All.
*SESSION: F-31.

Palmer, John J. - Computers and Counseling in Special Education. Program Area: Counseling, Administration/Management. Exceptionality: All.
*SESSION: S-4.

Panyan, Marion - the Effects of Microcomputer Based Instruction on the Academic and Social Progress of Autistic Students. Program Area: Computer Assisted Instruction, Research. Exceptionality: Autistic, Mentally Retarded.
*SESSION: S-9.

Parshall, Lucian - Micros and Minis in Michigan: A Potpourri of Management Programs for SEAs, ISDs and LEAs. Program Area: Administration/Management, Computer Managed Instruction, Individualized Student Planning. Exceptionality: All.
*SESSION: TH-9.

Preston, Lynn - Improving Written Expression Skills for the Learning Disabled Student: A Model for Effective Use of Direct Instruction, Microcomputers and Software Programs.

Program Area: Computer Assisted Instruction, Research. Exceptionality: Learning Disabilities, Physically Impaired.
*SESSION: TH-11.

Roahrig, Paul - Designing and Using a Revenue Computation and Projection Model. Program Area: Administration/Management, Software, Finance.
*SESSION: F-18.

Rucker, Chauncy N. - Implementing a Statewide Software Evaluating Model. Program Area: Software, Evaluation. Exceptionality: All.
*SESSION: S-17.

Rude-Parkins, Carolyn - Using LOGO to Develop Thinking Skills of Learning Disabled Students. Program Area: Computer Assisted Instruction. Exceptionality: Learning Disabilities.
*SESSION: S-2.

Sawyer, Tom - Planning, Implementing, Evaluating and Enjoying Management Through Computerization. Program Area: Administration/Management. Exceptionality: All.
*SESSION: F-9.

Seachris, Larry W. - Microcomputer Special Education Data Management System. Program Area: Administration and Management, Software.
*SESSION: F-32.

Silbert, Jerry - The Direct Instruction Educational Model: Hardware and Software Application. Program Area: Computer Assisted Instruction, Computer Managed Instruction, Assessment, Networks, Software. Exceptionality: Mildly Handicapped.
*SESSION: F-26.

Sitlington, Patricia L. - The Selection and Use of Microcomputer Software in Career/Vocational Programming for the Handicapped. Program Area: Computer Assisted Instruction. Exceptionality: All.
*SESSION: TH-13.

Stowitschek, Carole E. - The Microcomputer as an Electronic Teacher's Aide. Program Area: Computer Managed Instruction, Curriculum Development, Software. Exceptionality: Mildly Handicapped.
*SESSION: TH-3.

Strunk, DeForest L. - Training Special Educators to Use Microcomputer Technology in Educating the Handicapped. Program Area: Teacher Preparation. Exceptionality: All.
*SESSION: F-3.

Swindler, Richard - Writing to Read. Program Area: Computer Assisted Instruction, Hardware. Exceptionality: All.
*SESSION: S-25.

Taber, Florence M. - Don't Touch That Keyboard: Listen to Me Through My Voice Input Module. Program Area: Computer Assisted Instruction, Software. Exceptionality: All students who would have difficulty with the keyboard.
*SESSION: F-14.

Talley, Martha B. - Computer Managed Special Education - A Comparison of Three types of Districts. Program Area: Administration/Management, Individualized Student Planning, Software, Personnel Management, Teacher Preparation. Exceptionality: All.
*SESSION: S-5.

Thorkildsen, Ron - A Microcomputer Controlled Videodisc System for Bilingual Math Assessment. Program Area: Computer Managed Instruction, Administration/Management, Evaluation, Individualized Student Planning, Research, Videodiscs. Exceptionality: Mildly Handicapped/Bilingual.
*SESSION: F-24.

Walkington, Pat - LOGO and the Gifted Learner. Program Area: Curriculum Development, Research, Problem Solving, Software. Exceptionality: Gifted.
*SESSION: F-21.

Whiting, Barbara - ASSIST: Managing Data, Not Letting Data Manage You. Program Area: Administration/Management.
*SESSION: F-12.

Wilson, Kirk - Improving Productivity with Local Area Networks. Program Area: Administration/Management, Networks. Exceptionality: All.
*SESSION: S-7.

Zimmerman, Gloria - Computer Test Construction. Program Area: Evaluation. Exceptionality: All.
*SESSION: S-22.

Zoller, Nancy J. - Emerging Technologies in Public Education: Addressing Equity For Handicapped Students. Program Area: Policy and Finance. Exceptionality: All.
*SESSION: F-4.

APPENDIX C

REQUEST LETTERS & ANSWERS

APPENDIX C

REQUEST LETTERS & ANSWERS

A. Request for information letters regarding computer based education materials and/or research for Special Needs Individuals were sent to the following individuals and institutions:

1. Curriculum Development Directors, Departments of Education in all the Provinces of Canada, all the Territories, and all States in the United States.

2. Heads of Special Education Departments, all the universities across Canada.

3. The four Special Education Microelectronics Resource Centres in England: Manchester College of H.E., Hathersage Road, Manchester M13 0JA; Newcastle Polytechnic, Coach Lane Campus, Newcastle-Upon-Tyne NE7 7XA; Bristol Polytechnic, Redland Hill, Bristol B56 6U2, and; Grange Remedial Centre, Woodman Path, Hainault, Ilford, Essex 1G6 3AY.

4. Software Catalogue Houses obtained from the Sister Kenny Institute, 800 East 28th St. at Chicago Avenue, Minneapolis, Minnesota 55407:

Addison-Wesley, 2725 Sand Hill Road, Menlo Park, CA 94025.
Avant-Garde Creations, P.O. Box 30160, Eugene, OR 97403.

Barnell-Loft, Ltd., 959 Church St., Baldwin, NY 11510.
Bertamax, Inc., Suite 500, 101 Nickerson St. Seattle, WA 98109.
Brain-Link Software, 317 Montgomery, Ann Arbor, MI 48103.

Computer Skill Builders, 3130 N. Dodge Blvd., P.O. Box AZ 85733.
Creative Computing, 39 East Hanover Avenue, Morris Plains, NJ 07950.
Cuisenaire Company of America, 12 Church St. P.O. Box D, New Rochelle, NY 10805.

Data Command, P.O. Box 548, Kankakee, IL 60901.
Developmental Learning Materials, P.O. Box 4000, Allen, TX 75002.

Educational Activities, P.O. Box 392, Freeport, NY 11520.
Educational Computing Services, Inc., 136 Fairbanks Road, Oak Ridge, TN 37830.
Educational Coursework, 10 Bay Street, Dept. 66, Westport, CT 06880.
Edu-Ware Services, 28035 Dorothy Drive, Agora, CA 91301.
ERIC Clearinghouse on Handicapped & Gifted Children, The Council for Exceptional Children, 1920, 1920 Association

Drive, Reston, Virginia 22091-1589.

Hartley Courseware, P.O. Box 431, Dimondale, MI 48821.
Hayden Book Company, 50 Essex Street, Rochelle Park, NY 07662.

Journal of Learning Disabilities, 1331 East Thunderbird Dr., Tucson, AZ 85712.

Krell Software, 21 Millbrook Drive, Stony Brook, NY 11790.

Manitoba Computer Assisted Learning Consortium, Rm. 114, Educational Psychology Dept., Faculty of Education, University of Manitoba, Winnipeg, CANADA R3T 2N2.
McGraw-Hill, 1221 Avenue of the Americas, New York, NY 10020.
Micro-Ed, Inc. P.O. Box 24156, Minneapolis, MN 55424.
Micro Power & Light, 12820 Hillcrest Road, Dallas, TX 75230.
Microphys Programs, 2048 Ford Street, Brooklyn, NY 11229.
Micropi, Box 5524, Bellingham, WA 98227.
Microsoft Consumer Products, 10700 Northrup Way, Bellevue, WA 98004.
Milliken Publishing, Computer Department, 1100 Research Boulevard, St. Louis, MO 63132.
Milton Bradley Company, Shaker Road, East Longmeadow, MA 01028.
Minnesota Educational Computer Consortium, 2520 Broadway Drive, St. Paul, MN 55113.
Muse Software, 330 North Charles Street, Baltimore, MD 21201.

Program Design, Inc., 11 Idar Court, Greenwich, CT 06830.

Random House, High School Division, 2970 Brandywine Road, Suite 201, Atlanta, GA 30341.
Reader's Digest Services, Educational Division, Pleasantville, NY 10570.

Science Research Associates, Inc., 155 North Wacker Drive, Chicago, IL 60606.
Sterling Swift Publishing Co., 1600 Fortview Road, Austin, TX 78704.
Sunburst Communications, Rm. VH-5, 39 Washington Avenue, Pleasantville, NY 10570.
Sunset Software, 11750 Sunset Boulevard, Suite 414, Los Angeles, CA 90049.

Teach Yourself by Computer Software, 40 Stuyvesant Manor, Geneseo, NY 14454.
The Micro Center, P.O. Box 6, Pleasantville, NY 10570.
T.H.E.S.I.S., P.O. Box 147, Garden City, MI 48135.
T.I.E.S., 1925 W. County Road B-2, St. Paul, MN 55113.

Voice Machine Communications, Inc., 10522 Covington Circle, Villa Park, CA 92667.

Yukon Computer Products, Inc., P.O. Box 37088, Minneapolis, MN 55431.

COMMUNICATIONS:

Closing The Gap, P.O. Box 68, Henderson, MN 56044.
Communication Outlook, Artificial Language Lab, Computer Science Department, Michigan State University, East Lansing, MI 48824.
Computer User, TCCU Subscription, 2344 Nicollet Avenue, Suite 30, Minneapolis, MN 55404.

Link and Company, Cophi, 2030 Irving Park Road, Chicago, IL 606718.

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APPENDIX D

MICROELECTRONICS AND CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

APPENDIX D

MICROELECTRONICS AND CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

A SUMMARY OF MEP SPECIAL EDUCATION CURRICULUM DEVELOPMENT PROJECTS

The curriculum development projects are described in five sections: children with moderate learning difficulties; children with severe learning difficulties; those with specific disabilities of blindness, deafness or physical handicaps.

In each section, the projects are rank ordered according to the amount of MEP support they are receiving. The number before the title is the MEP reference number.

CHILDREN WITH MODERATE LEARNING DIFFICULTIES

45 Perceptual Development in Special Education
Project leader: Mick Trott, MACE Centre, West Midlands Regional Centre, Four Dwellings School, Dwellings Lane, Quinton, Birmingham B32 1RJ
Outcomes: The project has already produced a suite of perceptual development programs. Covers visual memory (for number, letter and shape), visual sequential memory (for number, shape, letter and word) and sorting (by size). Developmental age of around five years. Mainly for BBC, some for Apple and PET. Further work will be related to decision making, language and number skills. May include a language adventure program aimed at extending the child's vocabulary, a package for developing sentence construction skills and expression through language, and a package to develop number skills through simulation.
Project ends: March '84.
Some software will soon be available through MEP regional centres (in the 'Blue files'), some to be commercially published.

13. Maladjusted Children
Project Leader: Heather Govier, Davidson Centre, Davidson Road, Croydon CR0 6D. Tel. 656-0913.
Outcomes: CAL software to teach 'survival skills' and core curriculum subjects. Investigate effects of CAL on cognitive, social and affective learning. Investigate the use of interactive computer packages to assess development.
Programmes so far are Road Test (to develop knowledge of road signs), Adventure Game on Life Choices (to develop social skills), and Travelling (to develop the use of maps and timetables).
Uses 380Z and 480Z, some will be converted to Apple and BBC.
Project ends: August '83.
Software not yet available.

189. Concept Keyboard
Project Leader: Ian Glen, Brays School, Brays Road, Birmingham B26 INS - Tel. 021-743-5730.
Outcomes: programs to demonstrate the use of the concept keyboard. Completed programs include a shape/size/colour attribute suite, and a sentence suite for the 380Z, and Perspex (behind and before), CAIUS (Music), Reveal (Reversals) and Convey for the BBC Micro. More programs are planned. Project ends: March '84. Software will be available soon from Star Microterminals, 22 Hyde Street, Winchester, Hants. SO23 7DR.

56. Pupils With Special Needs
Project Leader: Dr. P. Avis, Educational Development Centre, Chequer Road, Doncaster DN1 2AF - Tel. 0302-68935 ext. 53. Outcomes: Programs to:
1. diagnose and prescribe remedial help in the area of reading skills and
2. provide a suitable format for creative writing;
3. teach budgetting and money management skills. BBC and Apple.
Project ends: August '83. Software not yet available.

156. Talking Computers
Project Leader: Colin Terrell, The College of St. Paul and St. Mary, The Park, Cheltenham, Glos. GL50 2RH - Tel. 0242-513836.
Outcomes: A set of at least 12 graded, linked programs aimed at children with reading difficulties of chronological age 8 to 11 years. For BBC Micro incorporating text, graphics and speech generation.
Project engs: April '84. Software not yet available.

68. Visual Stimulus Developments
Project Leader: G. Gorst, S. Glamorgan College of H.E., Llandaff Centre, Western Avenue, Cardiff CF5 2YB - Tel. 0222-561241/5.
Outcomes: Development of:
(a) a dedicated 8x8 array of lights that can be programmed. Designed to stimulate the severely handicapped.
(b) programs for shape and colour recognition.
Project ends: August '81. Software not yet available.

90. Progress Monitoring for Slow Learners
Project Leader: J.H. Phillips, Ysgol Belmont, Windmill Road, Buckley, Glwyd CH7 3HA - Tel. 024-454-3971.
Outcomes: Software to enable the teacher to have a comprehensive record of a child's progress in attainment, development, motor, concentration, tension, orientation and social and vocational skills.
Project ends: December '83. Software not yet available.

175. Synthetic Speech
Project Leader: J.R. Fletcher, Higher Side Comp. School,

Cumber Lane, Whiston, Merseyside L35 7JR - Tel. 051-426-5715.
Outcomes: Six programs to assist in the area of literacy recognition, consenant blends and vowel combinations, sentence skills, punctuation, comprehension, spelling. On Vic 20.
Project ends: March '83. Software not yet available.

96. Social and Life Skills (Cooking)
Project Leader: Miss Susan Gates, Silverhill School, Newcastle - Tel. 0632-745490.
Outcomes: Software to help teach the cooking process. This is part of a project mainly funded by the M.S.C., and overseen by Colin Richards, Newcastle SEMERC Manager.
Project ends: October '83. Software not yet available.

105. Study Skills
Project Leader: B. Robinson, Westgate School, Cheriton Road, Winchester SO22 2RB - Tel. 0962-54757.
Outcomes: Four packages to cover each of the following reading and study strategies: Cloze procedure, Sequencing, Skim reading and scanning. MEP is paying for further developments and evaluation. Commodor 30000 and 40000 and BBC Micro.
Project ends: March '83. Software available soon.

CET Software Project
Project Leader: J. Morton, 14 Home Close, Harlow CM20 3PD - Tel. 0279-25306.
Outcomes: The program will ascertain what computer programs are available to help with certain specified areas of the curriculum, and will be appraised by a number of teachers in special schools. This will result in information sheets and will identify the gaps, and promote the writing of further software to fill those gaps.
Project ends: September '83. Information sheets not yet available.

CHILDREN WITH SEVERE LEARNING DIFFICULTIES

191. Individualised Curriculum
Project Leader: C. Robson, Huddersfield Polytechnic, Queensgate, Huddersfield HD1 3DH - Tel. 0484-22288.
Outcomes: Programs and supporting materials to assist ESN(S) schools to implement an individual based curriculum where the educational programme for each child is tailored to his individual needs and progress. CARA (Curriculum and Recording Aid) will be available on the BBC Micro and 380Z.
Project ends: March '84. Software not yet available.

132. Woolley Wood
Project Leader: A. Salvadori, Woolley Wood School, Oaks Fold Road, Sheffield S5 0TG - Tel. 0742-386885.
Outcomes: A program specifically for teachers from which they can create their own child-centred programs without

having to learn a computer language. Will teach a profoundly handicapped child the association between the keyboard/switch and the screen and early number and reading skills such as association between a word and a picture, number and objects, etc. May include some prototype hardware. BBC Micro.
Project ends: December '83. Software not yet available.

138. Micro-Active
Project Leader: R.G. Dyke, Manchester SEMERC, Manchester College of H.E., Hathersage Road, Manchester M13 0JA - Tel. 061-225-9054.
Outcomes: Two packages of micro-controlled switches and electrical toys to play a part in developing educational activities for profoundly, mentally handicapped pupils and young physically handicapped children. One on the Sinclair Spectrum and one on BBC Model B.
Project ends: March '84. Software not yet available.

DEAF AND PARTIALLY HEARING

190. Linguistic Development
Project Leader: Dr. A. Rostron, Dept. Psychology, University of Hull, Hull HU6 7RX - Tel. 0482-46311.
Outcomes: Eight programs and supporting documentation designed to assist linguistic development in the deaf. The programs will show how language works through seeing it produce an effect on the environment. Based on Crystal's language development profiles. Mainly for the BBC Micro, some on SWITCH6800.
Project ends: December '84. Software not yet available.

1 Picture Language
Project Leader: Bernard Chapman, Bristol University School of Education, Bristol BS8 1JA - Tel. 0272 24161 x 928.
Outcomes: Programs to engage children in linguistic activity at the level of vocabulary, phrases, sentences or free writing and incorporating work on case, tense, number and voice. Initially uses rebus symbol system, leading into traditional orthography. Uses BBC Micro and Concept Keyboard.
Project ends: August '83. Software not yet available.

12. Deaf Pupils Project
Project Leader: Dr. P.W.S. Stevenson, Norwich High School for Girls, Newmarket Road, Norwich NR2 2H - Tel. 0603-53265.
Outcomes: Programs to reinforce and extend numeric, temporal and linguistic concepts without extensive use of written or spoken instruction, relying on good computer graphics in colour. Programs for young deaf children. "Multiplication Tables", "Spelling" and "Letter Tracing" have wider applicability. Tracing, VSF, Language, Colour programs are more deaf specific.
Project ends: August '83. Software not yet available.

58. Animation and Language Development
Project Leader: G. Dalziell, Thorn Park School for the Deaf, Thorn Lane, Bingley Road, Bradford BD9 6RY - Tel. 0274-497866.
Outcomes: Each program uses a limited word store and within those limits checks the child's sentences and animates any valid sentence by animated graphics. Suitable for ESN(S), E2L, Deaf. Uses BBC Micro.
Project ends: August '83. Software not yet available.

BLIND AND PARTIALLY SIGHTED

193. Synthetic Speech for the Blind
Project Leader: T. Vincent, Open University, Walton Hall, Milton Keynes MK7 6 - Tel. 0908-74066.
Outcomes: Software using speech synthesis (Votrax) for the blind and partially sighted. Includes (a) programs to teach grade 1 Braille (input from Perkins Keyboard or Concept Keyboard) and some grade 2 Braille words, (b) Software to allow programming in Braille with the output as synthetic speech and some demonstration programs of speech synthesis.
Project ends: May '83. Software not yet available.

PHYSICALLY HANDICAPPED

57. Programs For the Severely Handicapped
Project Leader: J. Turner, Springfield School, Cawthorne Close, Kirkby L32 3X0 - Tel. 051-546-3518.
Outcomes: Programs on communication, pre-reading and reading skills and the development of mathematical concepts. A booklet on the construction of input/output devices which can be interfaced to the computer. For physically-handicapped children of 2-18.
Project ends: August '83. Software not yet available.

8. Teaching Tools For Communication
Project Leader: P. Marsden, Westbrook School, Long Eaton, Derbyshire - Tel. 060-76-69769.
Outcomes: Produce hardware and software to enable a ZX81 or Spectrum to act as a talking communication aid. The "Black Box" will include a scanner board and Votrax speech synthesizer. As developed, will be for a single switch user, and not suitable for front ending to other micros.
Project ends: March '83. Software not yet available.

APPENDIX E

SPECIAL EDUCATION SOFTWARE

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SPECIAL EDUCATION SOFTWARE

GROUP	GRADES	NAME	DTS	COMPU	CO.	PRICE
		INTEGER FIX		AP	BRE	20.00
		HANDI-KEYS		TRS	RSM	36.00
		COMMUNITREE-FIRST EDITION		AP	CTG	250.00
		BUS ROUTE PLANNING PKG		AP	IEC	
		TROJECT IEP		AP	ENI	1495.
		COMCAL		COM	EJC	
		READ N SPELL	D	AP	PDI	
		MCE		AP	FMT	
		TYPEMASTER,LEARNING BOX		AP	FMA	
	K-1	ALPHABET/KEYBOARD		AP	RAH	53.00
	K-1	ALPHAKEY	D	AP/TR	BTM	29.80
		APPLE DIALOG	D	AP	IHS	12.00
		COMPUTING IN LOGOLAND	T	AP	STS	
		ALMANAC-THE TIME MACHINE		AP	WRP	29.95
		TUTORIAL WITH DRILL & PR	D	A/T/P	STS	
		MOTHER GOOSE RHYMES		AP/TR	GEA	
	K-6	BIKE STORY		PT/TR	QUI	24.95
		MATH INVADERS		AP	WCE	45.00
		ELEMENTS OF MUSIC		AP	ECA	99.95
		SPEC. ED GR. & DEV. TUTOR	T	AP	LOVE	200.00
		ASSIGNMENT SET		AP	IHS	4.25
		AUTOPICT I		TRS	MDT	
		AUTOPIC II		TRS	MDT	
		GRAPHICS & SPEECH SYNTH.		TI	URM	30.00
		INTELLIGENT VIDEODISC		AP	ECC	
		TUTOMATH		TRS	PWP	19.95
		LOVE		AP	LPC	
		APPLIED BEHAVIOR ANALYSIS	T	AP	EHS	200.00
		SPECIAL EDUCATION	T	AP	ELM	600.00
		INDIVIDUAL STUDY CENTER		AP/TR	TYC	
		INDIVIDUAL PLAN SYSTEM		AP/IB	LTI	495.00
		INFO. MANAGEMENT/SPEC. ED		DATAP	EXED	
		MODULARIZED STUD. MANAGE			MEAN	5500
		PROJECT IEP		AP	ENI	1495.
		REPORT WRITER/RECORD KEEP		A/T/I	SMS	
		ADMIN. PLANNING SYSTEM		A/I/D	LTI	1195.
		B.O.P		A/T/C	EXED	
		CURRICULUM MANAGE SYSTEM		A/I/D	LTI	295.00
		2ES EDUCATIONAL SYSTEM		AP	AGC	250.00
		SP. ED. READ/MATH			MEAN	3000.
		TEACHER UTILITIES	D	AP	GAI	29.95
BL		PEACHY WRITER-BOLD		AP	31B	
DH	1-	MORE THAN TEN	D	AP/PT	QUI	40.00
DH	2-5	MONEY! MONEY!	D	AP	HCI	39.95
DH	K-3	MONEY MASTER	D	TRS	QUI	17.95
DH		MONEY	D	TRS	EDC	
DH		MATH FOR EVERYDAY LIVING	D	A/T/P	QUI	67.00
DH	2	MATH-TELLING TIME	D	AP/PT	ROP	15.00
DH		MATH-MONEY	D	AP/PT	ROP	15.00
DH	1-	MATCHING CAPITAL LETTERS	D	COM	QUI	23.75
DH	K-	PICTURE COUNTING	D	TRS	MDT	
DH	1-	MATCH IT	D	TRS	BTM	25.00
DH	K-	PRESCHOOL MATH PKG.	D	AP/PT	QUI	39.95

DH	K-3	SHAPE PACKAGE	D	AP/PT	QUI	19.95
DH	K-	ALPHABET SQUARES	D	AP	QUI	29.95
DH	K-1	LETTER PROGRAMS	D	AP/PT	QUI	39.95
DH		LEARNING & PRACTICE MONEY	D	COM	RSI	69.00
DH	K-1	K-1 LANGUAGE PKG.	D	TRS	QUI	31.95
DH	K-1	K-1 LEARNING PKG.	D	TRS	QUI	31.95
DH	4-	CHANGE MAKING	D	TRS	RRB	29.85
DH	K	HODGE PODGE		AP	QUI	18.95
DH	2-6	HICKORY DICKORY	D	AT	APX	15.95
DH	7-12	COMPARATIVE BUYING		AP	QUE	225.00
DH	1	GOOD HEALTH HABITS	D	AP/PT	ROP	15.00
DH	K-1	COUNT 'EM	D	COM	QUI	9.95
DH	K-2	COUNT AND ADD	D	AP	QUI	19.95
DH	K-2	COUNTING	D	COM	QUI	9.95
DH	K-1	COUNTING BEE	D	AP	QUI	29.95
DH	4-6	DOLLARS AND CHANGE	D	COM	MEI	14.95
DH		DRESSING	D	AP	ADP	65.00
DH	3-5	EARLY ELEMENTARY I	D	AP	QUI	29.95
DH	3-5	EARLY ELEMENTARY II	D	AP	QUI	29.95
DH		EARLY GAMES	D	AP/TR	QUI	29.95
DH	K-4	EARLY LEARNING PACKAGES	D	TRS	QUI	35.00
DH		EARLY WORDS	D	AP	MBC	19.95
DH	K	FAMILY FUN	D		TKA	19.95
DH	K-	WORKING WITH THE ALPHABET	D	A/T/P	QUI	34.00
DH	K-3	THEIR WORLD	D	AP	QUI	160.00
DH	K-	SPELLING BEE WITH READ	D	AP	QUI	34.95
DH	2-4	USING MONEY/MAKE CHANGE	D	A/T/P	QUI	50.00
DH	7-	YOU CAN BANK ON IT	D	AP	QUI	375.00
DH	1-	TELLING TIME	D	TRS	BTM	54.50
DH	K-3	TELLING TIME COMPUTER SET	D	A/T/P	QUI	34.00
DH	4-9	HOME SAFE HOME	D	AP	QUI	225.00
DH	2-	TIME MASTER	D	AP	MPL	29.95
DH		FOX AND GEESE		TRS	MDT	
GF	4-	VOCABULARY BUILDERS	D	AP	PDI	
GF	4-	ALGEBRA	D	AP	PDI	
GF	7-	FRACTIONS GF 7-		FRACTIONS		D AP PDI
GF	PRE-	PRESCHOOL IQ BUILDER	D	AP	PDI	23.95
GF	4-	NUMBER SERIES	D	A-	PDI	
GF	4-	QUANTITATIVE COMPRISONS	D	AP	PDI	
GF	4-	ANALOGIES	D	AP	PDI	
GF	4-	VOCAB BUILDER 1-BEGIN.	D	AP	PDI	
GF	4-	VOCAB BUILDER - ADVANCED	D	AP	PDI	
GF	2-	ROCKY'S BOOTS	S	AP	LNC	75.00
HI		FINGERSPELLING	D	AT	APE	70.00
HI		DEAFSIGN	D	TRS	ACS	69.95
HI		COMPUTER FINGERSPELLING	D	TRS	K & S	
HI		LIP-READER TRAINER		AP	UER	
HI		FINGERSPELLING/PET	D	PT	DNB	
HI		VISUAL COMPUTER AUGMENTER		INTEL	TJH	
HI		MICRO-LADS	D	AP	LLS	170.00
HI		SPEAK UP	D	AP	LLS	95.00
HI		FIRST CATEGORIES	D	AP	LLS	120.00
HI		FIRST WORDS	D	AP	LLS	185.00
LD	K-2	BEGINNING MATH CONCEPTS	D	A/T/P	QUE	67.00
LD		VAKT '80		TRS	CHP	29.95
LD		A COMPUTER IS: TERMS	D	AP	MPL	34.95
LD		LETTER RECOGNITION	D	AP	HCI	26.95
LD	7-12	BASIC PROG. FOR MICROS		AP	NES	97.00
LD	1-	WORD WISE BASAL I	D	AP	TIE	199.95
LD	1-	WORD WISE BASAL 2	D	AP	TIE	374.94

LD	1-	WORD FAMILIES	D	AP	HCI	29.95
LD	K-	WINDOWS TO READING	D	COM	MCE	
LD	4-	WHO,WHAT,WHEN,WHERE,WHY	D	AP	HCI	35.95
LD	1-	VOWELS	D	COM	QUI	39.95
LD	1-	VOWELS	D	AP	HCI	93.05
LD	2-4	USING A CALENDAR GR.2-4	D	AP	HCI	39.95
LD	1-	WORD WISE BASAL 3	D	AP	TIE	224.95
LD	3-5	WORK SERIES	T	AP/TR	AQP	175.00
LD	3-	INTRO TO MATH ON THE COMP	D	A/T/P	QUI	40.00
LD		BUS STORY	D	TR/PT	QUI	24.95
LD	9-	DRIVER EDUCATION	D	PT	QUI	29.85
LD	7-	DRIVER EDUCATION SET	D	VIC	MEI	39.95
LD		MULTIPLE SKILLS	D	AP	HCI	
LD		GRADUATED CYLINDER	D	PT	CBC	15.00
LD	9-	DRIVER'S AID	D	TRS	AQP	55.00
LD		GAME POWER FOR PHONICS	D	AP/TR	QUI	25.00
LD	7-12	DRIVER'S EDUCATION VOL.1	D	AP	MEC	32.90
LD	5-8	ELEMENTARY VOL. 13	S	AP	MEC	38.70
LD	4-9	INCOME MEETS EXPENSES	D	AP	QUI	460.00
LD		FIRST AID AND SAFETY	D	AT	DES	79.00
LD	7-9	JOB READINESS	D	AP	QUI	225.00
LD	9-12	LIFE CHALLENGES	S	AP	AQP	169.00
LD	4-	MEMORY MYTH	D	AP	QUI	19.95
LD	4-9	POISON PROOF YOUR HOME	D	AP	QUI	285.00
LD		MICROTUTOR II-ADDITION	T	AP	QUI	180.00
LD	4-9	STRANGE ENCOUNTERS	D	A/T/P	QUI	67.00
LD		MICROCOSM II	D	TRS	QUI	19.95
LD	K-3	SPACE WASTE RACE		TRS	QUI	24.95
LD		SCRAMBLED LETTERS & FLASH	D	TRS	EDA	14.95
LD	9-	READING SOMPREHENSION IV	D	AT/TR	QUI	79.00
LD	9-	READING COMPREHENSION 3	D	AT/TR	QUI	79.00
LD	2-	SUBTRACTION	D	A/T/P	QUI	20.00
LD	4-	SURVIVAL MATH	S	AP	SBR	50.00
LD		PERSONAL FINANCE	T	AP/TR	AQP	199.00
LD	3-5	PERSONAL CONSUMERSIM	T	AP/TR	AQP	235.00
LD		PAL	T	AP	QUI	100.00
LD		OUR WILD & CRAZY WORLD	D	A/T/P	QUI	85.00
LD	3-4	OUR WEIRD & WACKY WORLD	D	A/T/P	QUI	40.00
LD	K-	NURSERY TIME	D	AP	QUI	29.95
LD	1-	NUMBER LINE PKG.	D	AP/PT	QUI	39.95
LD	2-	MULTIPLICATION	D	AP/TR	QUI	115.00
LD		TENNIS ANYONE	D	AP/TR	DTC	29.95
LD	K-4	THE PEAR TREE	D	AP	QUI	40.00
LD	K-3	THE READING MACHINE	D	AP	QUI	59.95
LD	2-4	USING A CALENDAR	D	AP	HCI	39.95
LD		MICROCOSM I	D	TRS	QUI	19.95
LD		MICRO BASED VERBAL EXC.	D	TRS	AES	
LD		VOWELS TUTORIAL	T	AP	HCI	120.00
LD	2-	TIC TAC TOE-HARD & SOFT C	D	TI	MCC	9.95
LD	K-	MATH'S FOR FUN	D	AT	QUI	14.95
LD		MATH PACKAGE	D	COM	QUI	59.95
LD	K-6	MATH MACHINE	D	AP	SEP	79.95
LD		MATH LAB	D	AP	ETI	80.00
LD	2-	TIC TAC TOE HARD & SOFT G	D	TI	MCC	9.95
LD	5-	MATH FOR YOUNG CONSUMER	S	A/T/P	QUI	67.00
LD		MATH BID	D	COM	QUI	7.95
LD		MARKET SURVEY	S	PET	CMR	20.00
LD	4-	MAP READING	D	AP	MPL	19.95
LD	4-	LONG DIVISION	D	A/T/P	QUI	25.00
LD	6-12	LIFESKILL READ SERIES II	D	AP/TR	QUI	209.65

LD	6-12	LIFESKILL READING SERIESI	D	AP/TR	QUI	240.00
LD	4-	US TIME ZONES	D	COM	QUI	7.95
LD	7-12	INTRO TO MATH ON COMPUTER	D	AP	NES	39.95
LD	7-	LEARNING IMPROVEMENT	D	AP	MCE	165.00
LD		WORD STRUCTURE A-D	D	AP	BWE	160.00
LD		WORD STRUCTURE A-H	D	AP	BWE	320.00
LD		SENTENCE STRUCTURE E-H	D	AP	BWE	160.00
LD		SENTENCE STRUCTURE A-D	D	AP	BWE	160.00
LD		SENTENCE STRUCTURE A-H	D	AP	BWE	320.00
LD		GEOMETRIC CONCEPTS C-D	D	AP	BWE	127.50
LD		GEOMETRIC CONCEPTS A-B	D	AP	BWE	85.00
LD	4-6	READ/DEVEL:PARAGRAPHS	D	TRS	RAS	199.00
LD	4-6	READ/DEVEL:SENTENCES	D	TRS	RAS	199.00
LD	4-	HIGH MOTIVATION READING	D	TRS	RAS	AV/69.
LD	7-	JOB HUNTING RESOURCES	D	AP	MCE	44.95
LD	7-	SUCCESSFUL JOB INTERVIEWS	D	AP	MCE	44.95
LD	7-	FILLING OUT JOB APPLIC.	D	AP	MCE	44.95
LD	7-	JOB READINESS:ATTITUDE	D	AP	MCE	44.95
LD	7-	JOB READINESS:ASSESSMENT	D	AP	MCE	165.00
LD	7-	HOME SAFE HOME	D	AP	MCE	165.00
LD	7-	POISON PROOF YOUR HOME	D	AP	MCE	210.00
LD	7-	$$$ MANAGEMENT ASSESSMENT	D	AP	MCE	165.00
LD	7-	$$$MANAGEMENT:BASIC TEST	D	AP	MCE	44.95
LD	7-	INCOME MEETS EXPENSES	D	AP	MCE	340.00
LD	7-	YOU CAN BANK ON IT	D	AP	MCE	285.00
LD	7-	PERSONAL FINANCE LIBRARY	D	AP	MCE	749.95
LD	7-	ANALYZING AN AD	D	AP	MCE	44.95
LD	7-	PERSONAL HABITS=JOBSUCCES	D	AP	MCE	44.95
LD	7-	JOB SURVIVAL SERIES	D	AP	MCE	119.95
LD	7-	WORK HABITS = JOB SUCCESS	D	AP	MCE	44.95
LD	7-	FIRST DAY ON THE JOB	D	AP	MCE	44.95
LD	7-	STRATEGIES:TEST TAKING	D	AP	MCE	44.95
LD	7-	IMPROVING YOUR MEMORY	D	AP	MCE	44.95
LD	7-	FOLLOWING WRITTEN DIRECTS	D	AP	MCE	44.95
LD	7-	EFFECTIVE STUDY SKILLS	D	AP	MCE	44.95
LD		WORD STRUCTURE E-H	D	AP	BWE	160.00
LD	7-	CASH VS CREDIT BUYING	D	AP	MCE	44.50
LD	7-	BE AN INFORMED SHOPPER	D	AP	MCE	44.95
LD	7-	COMPARATIVE BUYING SERIES	D	AP	MCE	165.00
LD	7-	UNDERSTAND SALES BUYING	D	AP	MCE	44.95
LD	7-	BUYING WISELY	D	AP	MCE	44.95
LD	7-	SOLVE MULTISTEP PROBLEMS	D	AP	MCE	44.95
LD	7-	SOLVE ADDIT/MULTIP PROBS	D	AP	MCE	44.95
LD	7-	SOLVE SUBTR/DIVIS PROBS	D	AP	MCE	44.95
LD	7-	PROB SOLVING PROCESS	D	AP	MCE	44.95
LD	7-	PROB/SOLVING EVERYDAYMATH	D	AP	MCE	165.00
LD	7-	MANAGING YOUR TIME	D	AP	MCE	44.95
LD	7-	FINANCING A CAR	D	AP	MCE	44.95
LD	7-12	SPELLING BUILDER	D	AP	NES	26.50
LD	7-12	BASIC GRAMMAR	D	AP	NES	24.95
LD	7-12	ENGLISH BASICS:ADVERBS	D	AP	NES	39.95
LD	7-12	ENGLISH BASICS:ADJECTIVES	D	AP	NES	39.95
LD	7-12	BUILDING SENTENCES	D	AP	NES	24.95
LD	7-12	ENGLISH BASICS: VERBS	D	AP	NES	39.95
LD	7-12	ENGLISH BASICS: PRONOUNS	D	AP	NES	39.95
LD	7-12	ENGLISH BASICS: NOUNS	D	AP	NES	39.95
LD	7-12	READING COMPREHENSION 2	D	AP	NES	39.95
LD	7-12	READING COMPREHENSION 1	D	AP	NES	39.95
LD	7-12	CLASSIFICATION SKILLS	D	AP	NES	23.95
LD	7-12	LIBRARY SKILLS	D	AP	NES	24.95

LD	7-12	BUILD VOCAB HOMONYMS	D	AP	NES	39.95
LD	7-12	BUILD VOCAB ANTON/SYNONYM	D	AP	NES	39.95
LD	7-12	INTRO TO DECIMALS	D	AP	NES	39.95
LD	7-12	FRACTIONS REVIEW	D	AP	NES	39.95
LD	7-12	MISSING MATH FACTS	D	AP	NES	39.95
LD	7-12	COMPUTER MATH PACKAGE 2	D	AP	NES	24.95
LD	7-12	COMPUTER MATH PACKAGE 1	D	AP	NES	24.95
LD	4-8	DIVISION	D	AP/TR	QUI	115.00
LD		EDUFUN	D	TRS	JLT	10.00
LD	K-3	DIRECTION & DISTANCS	D	COM	QUI	10.00
LD	7-	CONTEMPORARY LIVING	T	AP/T	API	175.00
LD		CONSONANTS	D	AP	HCI	79.95
LD	6	COMPUTERIZED READING MACH	D	AP	QUE	60.00
LD		COMPUTER ANIMATED READING	D	AP	BCB	100.00
LD	K-2	COLOR GUESS	D	AP	IDT	12.95
LD		CLOCK	D	C/TI	MEI	10.00
LD	1-5	CLOCK	D	AP	HCI	39.95
LD	K-6	CHILDREN'S CAROUSEL	D	AP	QUI	19.95
LD	4-	CALENDAR SKILLS	D	AP	HCI	29.95
LD		CALENDAR	D	V/P/A	QUI	20.00
LD		BEGINNING READING PKG.	D	PT	QUE	59.95
LD	K-6	BASIC ARITHMETIC	D	AT	SBT	30.00
LD	1-6	BALLOON BANDIT	D	AT	QUE	50.00
LD	7-	ADVERTISING TECHNIQUES		AP	MPL	24.95
LD	3-6	ADVENTURES AROUND WORLD	D	A/T/P	QUI	67.00
LD	2-	ADD WITH CARRY	D	A/T/P	QUI	20.00
LD	1-	ADD. & SUB./WHOLE NUMBERS	T	A/P/T	QUI	67.00
LD		ADDITION	D	AP/TR	QUI	115.00
LD	K-12	2ES COURSEWARE	D	AP	AGC	29.95
LD	3-	1,2,3 DIGIT MULTIPLI.	D	A/T/P	MWK	25.00
LD	9-	LESSONS IN ALGEBRA		AP/TR	GEA	
LD	9-	DRIVE TO LIVE	D	AP	GHS	
LD	9-	DRS.ED.	D	TR/PT	J&M	49.95
LD		WORLD OF COUNTING	D	AP	EED	24.95
LD	K-6	THE MATH MACHINE	D	AP	SEP	100.00
LD		PRIMER B1		AP	L&M	
LD		MULTISENSORY PROGRAM	D	TRS	MLC	
LD		CRITICAL READING A-H	D	AP	BWE	350.00
LD	2-12	HOMONYMS,VERBS,& PRONOUNS	D	AP	MPC	120.00
LD		CRITICAL READING A-D	D	AP	BWE	170.00
LD		CRITICAL READING_E-H	D	AP	BWE	180.00
LD	3-8	DIASCRIPTIVE READING	T	TRS	GAI	245.00
LD	5-9	HOW TO READ/CONTENT AREAS	D	TRS	GAI	49.00
LD	1-7	VOCABULARY PLACEMENT TEST	D	TRS	GAI	24.95
LD		READABILITY INDEX	D	PT	GAI	26.90
LD		READABILITY ANALYSIS	D	AP	GAI	29.95
LD	4-8	PREFIXES	D	AP	GAI	29.95
LD	4-8	ELEMENTARY MATH SYSTEM	D	AP	STS	495.00
LD	3-12	FUNDAMENTALS OF MATH	D	PT/AP	STS	249.95
LD	K-10	MATH SEQUENCES	D	AP	MPC	675.00
LD	K-10	LETTER RECOGNITION	D	AP	MPC	110.00
LD		MATH LAB		AP	EDT	
LD	3-10	THE SPELLING SYSTEM	T	AP	MPC	290.00
LD	3-12	COMPREHENSION POWER	D	AP	MPC	225.00
LD	2-10	CLOZE-PLUS	D	AP	MPC	225.00
LD	3-10	SENTENCE COMBINING	D	AP	MPC	140.00
LD		ELEMENTS OF MATH	D	AP	ECS	49.95
LD		SUBTRACTION	T	AP	QUI	180.00
LD		DIVISION		AP	QUI	180.00
LD		PROGRAMS FOR COGNITIVE RE		TR/AP	LSA	

LD		MULTIPLICATION	T	AP	QUI	180.00
LD		TERRAPIN LOGO		AP	COM	150.00
LD	1-4	WRITE/ONE		PT/AP	COM	100.00
LD		KIDSTUFF & TURTLE TRACKS		AP/CM	SCL	70.00
LD	K	JUGGLES' RAINBOW	S	AP	LNC	45.00
LD	K-4	GERTRUDE'S SECRET	S	AP	LNC	75.00
LD		VAKT '80		TRS	FEK	29.95
LD	1-	GERTRUDE'S PUZZLE	S	AP	LNC	75.00
PH		COGREHAB		AP/TR	LSA	195.00
PH		REJOB		AP	KMB	2500.
PH		HOMEWORK	D	PLATO	CDC	?
PH		NAME JUMBLE AND WHAT NAME	D	TRS	MDT	
PH		SPELLING FOR PHYS. HAND.	D	AP	GAI	29.95
PH		EARLY ELEM I-SPEC. VERS.		AP	COT	29.95
PH		EARLY ELEM. II-SPEC. VER.		AP	COT	29.95
PH		SHAPES	D	TRS	MDT	
PH		THE EVALUATION SYSTEM		AP	IOR	460.00
PH		HANDICAPPED WORD GAMES	D	PT/TR	QUI	25.00
PH		RACE 2		TRS	MDT	
PH		EZBAS		AP	IOR	50.00
PH		MOTOR-HANDICAP SUPPORT		Z H89	ATI	499.00
PH		SPECIAL EDITOR		AP	CHP	10.00
PH		SPECIAL INPUT DISKS		AP	CHP	10.00
PH		EXTEND		AP	WCB	200.00
SH		VOCALIZATION TRAINER		TRS	SVT	50.00
SH		SAYIT FOR TYPE-N-TALK		TRS	BSS	125.00

APPENDIX E.1

SPECIAL EDUCATION SOFTWARE CON'T.

SPECIAL EDUCATION SOFTWARE CON'T

GROUP	GRADES	NAME	DTS	COMPU	COMPA	PRICE
		NOTE NAME DRILL	D	AP	ECS	39.95
		KEYBOARD NOTE DRILL	D	AP	ECS	39.95
		KEY-SIGNITURE DRILL	D	AP	ECS	39.95
BL		SAY IT		AP	SCU	30.00
BL		ANGLOPHONE I		TRS	PPM	8.00
BL		TRANSLATOR		AP	CHP	10.00
BL		READING MACHINE FOR BLIND			RCK	
BL		GRADE TWO TRANSLATOR		AP	RDC	150.00
BL		ED-IT TEXT EDITOR		AP	RES	100.00
BL		DUXBURY BRAILLE TRANSLATO		CP/M	DUX	5000.0
BL		BRAILLE-EDIT		AP	RDC	200.00
BL		BRAILLE WORD PROCESSING		AP	RST	
BL		BRAILLE DISPLAY		TRS	KME	
BL		BASIC INTERPRETER/BLIND		TRS	JSS	15.00
BL		EIGHTYTALKER		CP/M	CP/M	8.00
BL		QUIK-TALK		AP	CSR	695.00
BL		MUSICAL LANG. TERMINAL		AP	CFR	
BL		ELECTRONIC BLACKBOARD		AP	RDC	400.00
BL		BRAILLE-TRANSLATOR		ANY	TRA	
BL		BLIND PROGRAMMING UTILITY		TRS	JSS	
BL		TEXTTALKER		AP	SEC	24.95
BL		LARGE TYPE		ANY	NIRE	19.95
BL		BRAILLE ON TV	D		AUTHO	
DH		FIRST WORDS	D	AP	LLS	
DH	18 MONTHS-	PROGS FOR EARLY ACQ OF LA	D	AP	PSI	975.00
DH		TIME TUTOR	D	AP	TSC	25.00
GF	K-6	TLC	S	AP/TR	TLC	60.00
HI		MATHWARE		AP	CSD	1500.0
HI		EAR CHALLENGER		AP	ECS	39.95
HI		VOPIC	S	AIM-6	CFE	50.00
LD		SPECIAL SKILL BUILDER I	D	AP	CTI	29.95
LD		EARL'S WORD POWER	D	AP/TR	GEA	
PH		SYMBOL SELECTOR		TRS	MDT	
PH		MICROCOMMUNICATOR FOR PH		AP	G&A	45.00
PH		SQUARE SELECTOR		TRS	MDT	
PH		THE COMMUNICATION & CONT.		TRS	IOR	125.00
PH		THE B-A-R DEVICE		AP	RJF	
PH		TAP(TYPING ASSISTANCE)		AP	RHA	
PH		PICTURE -COM		AP	IOR	40.00
PH		WORD-COM		AP	IOR	45.00
PH		VERSA-SCAN		Z-80	CSS	500.00
PH		THE COMMUNICATOR		AP	PRS	129.95
PH		THE COMMUNICATION DEVICE		TRS	IOR	100.00
PH		SUPERWRITER			NIRE	898.50
PH		SPEAKING COMM.DEVICE		TRS	IOR	200.00
PH		SPEAKEASY COMM. SYSTEM		AP	ISS	500.00
PH		SMARTTERM		AP	CHP	10.00
PH		RANDOM SQUARES		TRS	MDT	
PH		QUICK-SCAN		TRS	IOR	30.00
PH		PHONICS, TEXT & GRAPHICS		AP	CHP	10.00
PH		OAKS II WORDPROCESSOR		AP	TWC	
PH		NU COMMUNICATION & DEVICE		AP	PRC	285.00
PH		MESSAGE WRITER		AP	GSG	75.00

PH		LETTER PROCESSOR		VIC	RBI	
PH		INSTA-PRINT		TRS	IOR	5.00
PH		HANDICAPPED TRPEWRITER		AP	RMS	200.00
PH		HANDI-WRITER		TRS	HFB	16.95
PH		COMPUTER COMMUNICATION		AP	KPC	
PH		COMMUNI-MATE		CBM	GVI	100.00
PH		AUTOTYPE II		TRS	MDT	
PH		ACADEMICS WITH SCANNING		AP	CHP	10.00
PH		WORDS+ -NON-ORAL COMM		AP/TR	WAW	75.00
PH		TALKING BLISSAPPLE		AP	CHP	35.00
PH		SPEAKING COMM/CONTROL DEV		TRS	IOR	225.00
PH		ONE SWITCH INPUT SUBRT.		TRS	MAC	
PH		HANDI-KEYS PERSON. KEYBD			RSM	
PH		HANDI-KEYS-KEYBOARD MOD.		TRS	RSM	50.00
PH		SINGLE SWITCH ASSESSMENT		AP	R&S	40.00
PH		AUTOTYPE 1		TRS	MDTS	
PH		TALK TYPER-VOICE/WORDPRO		AP	R&S	
PH		SCANNING PROGRAM		AP	FBD	87.00
PH		OPTICALLY ACTIVATED KEYS		TI	TWC	
PH		MATH DISK		AP	CHP	10.00
PH		JOHN'S PROGRAM-INPUT DEV.		AP	CHP	10.00
PH		HANDI TERM-COMMUNICATION		AP	JGI	
PH		FLORIDA SCANNER		AP	R&S	45.00
PH		ACAD. WITH SCANNING-MATH		AP	CHP	10.00
PH		MANUAL-QWERTY REPLACEMENT		A/COM	WMP	
PH		TIM-COMMUNICATION PROG.			CPH	
PH		SPELLING FOR PH	D	AP	SBT	30.00
PH		SINGLE SWITCH GAME LIBRAR	D	AP	TFS	
PH		AUTARITH I	D	TRS	MDT	
PH	K-6	SPECIAL NEEDS VOLUME 1	D	AP	MECC	30.00
PH		C.U.R.T.I.S.	D	TRS	IOR	
PH		MOTOR TRAINING GAMES	D	AP	CHP	10.00
SH		INSTA-SPEAK		TRS	IOR	30.00
SH		THE ORATOR		Z-80	ACP	
SH		SYNTAX.1		AP	DMH	
SH		TALK II-SPEECH OUTPUT SYS		AP	R&S	90.00
SH		TOTAL TALK COMPUTER TERM.			DBB	
SH		MORSE CODE CARTRIDEGE		COM	ALL	
SH		TALKING BLISSAPPLE		AP	BSC	45.00
SH		VISIBLE SPEECH AID	D	AP	SRC	675.00

APPENDIX F

SOFTWARE COMPANIES

APPENDIX F

SOFTWARE COMPANIES

CODE	NAME	ADDRESS	CITY/STATE	ZIP	PHONE
ACP	P. DURAN-ARTS COMPUTER PROD.		BOSTON, MA		
ACS	ADVANCED COMPUTER SERVICES	D.K. JOHNSTON- 14 LYNNE L	FROSTPROOF, FL		
AES	A.E. SPRINGER	DEPT. OF ENGINEERING-SCI.	KILGORE COLLEGE, KILGORE, TEXAS		
AGC	AVANT-GARDE CREATIONS	POB 30160	EUGENE, OR	97403	
AGC	AVANT-GARDE CREATIONS	POB 30160	EUGENE, OR	97403	
ALL	DR. J.B. EULENBERG	ARTIFICIAL LANG. LAB	MICH. STATE U. EAST LANSING, MI	48824-1042	
APE	ATARI PROGRAM EXCHANGE	D. GARTON-POB 3705	SANTA CLARA, CA	95055	
AQP	AQUARIUS PUBLISHERS				
ATI	ARTRA INC.	POB 653	ARLINGTON, VA	22216	
AUTHOR	AUTHOR	5903 DANNY KAYE-BOX 3207	SAN ANTONIO, TX	78240	(512)696-8750
BCB	BRITANNICA COMPUTER BASED	75 HOMER AVE. UNIT ONE	TORONTO, ONT	M8Z 4X5	(416)252-5907
BIJ	BILL JAMES	5903 DANNY KAYE-BOX 3207	SAN ANTONIO, TX	78240	(512)696-8750
BLM	BRITANNICA LEARNING MATERIALS	POB 2249, BRITANNICA PL.	CAMBRIDGE, ONTARIO	N3C 3N4	(519)658-4621
BRE	BARRINGTON EDUCATIONAL	POB 863	BARRINGTON, ILLINOIS	60010	(312)658-4710
BSC	BLISSYMBOLICS COMMUNICATION	350 RUMSEY ROAD	TORONTO, ONTARIO, CANADA	M4G 1R8	(416)425-7835
BSS	BAYSIK SPEECH	STE. 289, 1259 EL CAMINO	MENLO PARK, CA	94025	
BTM	BERTAMAX				
BWE	BORG-WARNER EDUCATIONAL SYSTEM	600 WEST UNIVERSITY DR.	ARLINGTON HEIGHTS, ILL	60004	(800)942-6995
CBC	COW BAY COMPUTING				
CDC	CONTROL DATA CORPORATION	POB 0/HQA021	ATTN:PLATO INQUIRY, MINNEAPOLIS, MN	55440	(800)328-1109
CFE	CHRISTIAN FAMILY ENTERTAINMENT	1707 MOHAWK DR.	APPLETON, WI	54911	
CFR	CENTER FOR REHABILITATION	GEORGIA INSTIT. OF TECH.	ATLANTA, GEORGIA	30332	
CHP	COMPUTERS TO HELP PEOPLE, INC.	1221 W. JOHNSON ST.	MADISON, WI	53715	(608)257-5917
CMR	COMALDOR				
COM	COLLIER MACMILLAN, CANADA LTD.	1125B LESLIE ST.	DON MILLS, ONTARIO	M3C 2K2	(519)621-2440
COT	COMPU-TATIONS				
CP/M	CP/M USERS GROUP	1651 THIRD AVENUE	NEW YORK, NY	10028	
CPH	COMPUTERS FOR PHYSICALLY	7602 TALBERT AVENUE	HUNTINGTON BEACH, CALIFORNIA	92647	
CSD	R. LENNAN-CALIF. SCH. DEAF	3044 HORACE ST.	RIVERSIDE, CALIFORNIA		
CSR	COMPUTER SYSTEM RESOURCES, INC	3222 SW 35TH BOULEVARD	GAINSVILLE, FL	32608	(904)376-4276
CSS	SYBORG SOFTWARE SYSTEMS	3119 COSSELL DRIVE	INDIANAPOLIS, IN	46224	
CTG	THE COMMUNITREE GROUP	470 CASTRO ST., #207-3002	SAN FRANCISCO, CA	94114	(415)474-0933
CTI	COMPUTATIONS, INC.	POB 502	TROY, MICHIGAN	48099	(313)689-5059
DBB	D.B. BLAZIE	MARYLAND COMPUTER SERV.	FOREST HILL, MARYLAND	21050	
DES	DORSETT EDUCATIONAL SYSTEM	POB 1226	NORMAN, OK	73070	(405)321-0000
DMH	DR. MICHAEL HILLINGER	R.D. 2, BOX 68N	WATERBURY, VT	05676	(802)241-2600
DNB	D.N. BOYER	46 SYCAMORE STREET	ROCHESTER, N.Y.	14620	
DTC	DATA COMMAND	329 E. COURT ST.	KANKAKEE, IL	60901	(815)933-7735
DTC	DATA COMMAND	329 EAST COURT STREET	KANKAKEE, ILLIONOIS	60901	(815)433-7735
DUX	DUXBURY SYSTEMS, INC.	77 GREAT ROAD	ACTON, MA	01720	
ECC	EXCEPTIONAL CHILD CENTER	UMC 68, UTAH STATE UNIV.	LOGAN, UTAH	84321	
ECS	ELECTRONIC COURSEWARE SYSTEMS	POB 2374, STATION A	CHAMPAIGN, ILLINOIS	61820	(217)359-7099
ECS	ELECTRONIC COURSEWARE SYSTEMS	POB 2374, STATION A	CHAMPAIGN, ILLINOIS	61820	(217)359-7099
EDC	EDUCATION DEVELOPMENT CENTER	36 WOLVERHAMPTON ROAD	WALSALL		
EDQ	EDUCATIONAL ACTIVITIES	POB 392	FREEPORT, NY	11520	(516)-223-4666
EDT	EDU TECH	634 COMMONWEALTH AVE.	NEWTON CENTER, MA	02159	
EED	EDUCOMP ENTERPRISES DEPT.	191 NORTH 650 EAST	BOUNTIFUL, UT	84010	
EHS	E. HELMSTETTER	177 S. BELAIR ST.	DENVER, COLORADO	80222	(303)757-2519
EJC	E.J. CAIN JR.-DIR. STUDENT SER	COMMACK PUBLIC SCHOOLS	POB 150 COMMACK, NY		
ELM	E.L. MEYEN	1777 S. BELLAIRE ST.	DENVER, COLORADO	80222	(303)757-2579
EVI	EVANS-NEWTON, INC.	7650 EAST REDFIELD ROAD	SUITE D-5, SCOTTSDALE, ARIZONA	85260	
EXED	EX-ED COMPUTER SYSTEMS INC.	71-11 112 ST.	FORST HILLS, NY	11375	(212)268-0020
FBD	FIRST BROWARD DEVELOPMENT	4987 N. UNIVERSITY DRIVE	LAUDERHILL, FL	33321	(305)746-6506
FMA	FULLMER ASSOCIATES	1132 VIA JOSE	SAN JOSE, CALIFORNIA	95120	(408)997-1154

G&A	GROVER AND ASSOCIATES	7 MT. LASSEN DR.STE. D116	SAN RAFAEL, CA	94903	(415)479-5906
GAA	GRANT GROVER & ASSOCIATES	7 MT. LASSEN DR. D116	SAN RAFAEL, CA	94903	
GAI	GAMCO INDUSTRIES, INC.	BOX 1191C45	BIG SPRINGS, TX	79720-0211	(915)267-6327
GEA	G. EARL	1302 S. GENERAL MCMULLEN	SAN ANTONIO, TEXAS	78237	(512)434-3681
GHS	M. BLESSING	DEPT. OF SPECIAL EDUCATIO	GLADEWATER H.S., GLADEWATER, TEXAS		
GSG	ART GAYLORD & STAN SMITH	2208 COUNTRY SQUIRE DR.	URBANA, IL	61801	
GVI	GREEN VALLEY INFORMANTICS	769 N. SACRE LANE	MONMOUTH, OR	97361	
HAC	HARTLEY COURSEWARE, INC.	123 BRIDEGE ST.- BOX 419	DIMINDALE, MI	48821	(517)646-6458
HCI	HARTLEY COUREWARE, INC.	123 BRIDGE ST.- BOX 419	DIMONDALE, MI	48821	(517)646-6458
HCI	HARTLEY COURSEWARE, INC.				
HFB	HOWARD F. BATIE	12002 CHEVIOT DRIVE	HERNDON, VIRGINIA	22070	(703)437-3847
IDT	IDEATECH COMPANY				
IEM	G.W. TUBB	INST. OF EDUCATION MICRO	ILLINOIS STATE U, NORMAL, IL		
IHS	INDIAN HEAD SOFTWARE	1002 INDIAN HEAD DRIVE	SNOW HILL, NC	28580	(919)747-2839
IMT	F.M. TABER	KALAMAZOO MALL- BOX 250	PLAZA BLDG. KALAMAZOO, MICHIGAN	49007	
IOR	I.O.R. ENTERPRISES	RT. 6, BOX 20	CHAPEL HILL, NC	27514	
ISB	ILLINOIS STATE BOARD OF EDUC.	100 NORTH FIRST STREET	SPRINGFIELD, ILLINOIS	62777	
ISS	INTELLIGENT SOFTWARE SYSTEMS	POB 621	AMHERST, MA	01002	(412)549-0474
J&M	J & M BLESSING	327 MELBA	GLADEWATER, TEX	75647	
JGI	J. GEIM	1904 WESTFIELD DRIVE	FORT COLLINS, COLORADO	80526	(303)223-0844
JLT	J.L. TERPENNING	25 ROSE HILL PARK	CORNWALL, NY	12518	(914)534-3339
JSS	JAMES S. SCHAEFER	33 JACKSON ROAD	BERLIN, NJ	08009	(609)767-2751
K&S	K.C. KIHNEMAN & R.M. SALATHIEL	INSTITUTE OF CAI OF SIGNL	5909 W.LOOP S. SUITE 555 BELLAIRE	TX 77401	(713)667-2363
KMB	KLAUS M. BLACHE	422 TIMBERLINE DRIVE	ROCHESTER, MI	48063	
KME	K. MEWES	U. OF KANSAS, MEDICAL	KANSAS CITY, KANSAS		
KPC	KENDALL PAUL CROOKSTON	618 N. ASPEN CIRCLE	PRICE, UT		
L&F	B. LAND AND D. FARMER	395 BROOKTONDALE ROAD	BROOKTONDALE, NY	14817	
LLS	LAUREATE LEARNING SYSTEMS, INC	1 MILL ST.	BURLINGTON, VERMONT	05401	(802)862-7355
LNC	LEARNING COMPANY				
LOVE	J.F. HOLVOET & M. MULLIGAN	1777 S. BELLAIRE ST.	DENVER, COLORADO	80222	(303)757-2519
LPC	LOVE PUBLISHING COMPANY	1777 SOUTH BELAIR STREET	DENVER, COLORADO	80222	
LSA	R. GIANUTSOS AND C. KLITZNER	LIFE SCIENCE ASSOCIATES	BAYPORT, NEW YORK	11705	
LSI	LIFE SCIENCE ASSOCIATES	1 FENIMORE ROAD	BAYPORT, NY	11705	
LTI	LEARNING TOOLS INC.		CAMBRIDEG, MA	02139	
MAC	M.A. CHASE & DR. P. HAZAN	JOHNS HOPKINS UNIVERSITY	BALTIMORE, MARYLAND		
MBC	MERRY BEE COMMUNICATIONS	815 CREST DRIVE	OMAHA, NEBRASKA	68046	(402)592-3479
MCC	J. GREENBERG-MICROCOMPUTER CO.	34 MAPLE AVENUE-BOX 8	ARMONK, NY	10504	
MCE	MICROCOMPUTER EDUCATIONAL PROG	1575 KALAMAZOO MALL,#250	KALAMAZOO, MI	49007	(800)421-4157
MDT	M.D.T.S. LIB.	36 WOLVERHAMPTON ROAD	WALSALL		
MEAN	MEAN	256 NORTH WASHINGTON ST.	FALLS CHURCH, VIRGINIA	22046	(703)536-2310
MEC	F.E. KAGEL	MANALAPAN EDUCATIONAL CTR	MANALAPAN, NEW JERSEY		
MECC	MECC-PUBLICATIONS DEPT.	2520 BROADWAY DR.	ST. PAUL, MN		
MEI	MICRE-ED INC.				
MPC	MILLIKEN PUBLISHING CO.	1100 RESEARCH BLVD.	POB 21579, ST. LOUIS, MO	63132-0579	(314)991-4220
MPL	MICRO POWER & LIGHT CO.	12820 HILLCREST RD. #224	DALLAS, TX	75230	(214)239-6620
MWC	MICROCOMPUTER WORKSHOPS				
NES	NEW ENGLAND SCHOOL SUPPLY	POB 1581	SPRINGFIELD, MASSACHUSETTS	01101	(413)525-6411
NIRE	NATIONAL INSTITUTE FOR NIRE	97 DECKER ROAD	BUTLER, NJ	07405	
PBM	PETER B. MAGGS	2011 SIVER COURT ROAD	URBANA, ILLINOIS	61801	(217)333-6711
PDI	PROGRAM DESIGN INC.	95 EAST PUTNAM AVE.	GREENWICH, CT	06830	(203)661-8799
PDI	PROGRAM DESIGN INC.	11 IDAR COURT	GREENWICH, CT	06830	(203)661-8799
PPM	PROF. P. MAGGS	1414 LAW BLDG. U. OF ILL.	CHAMPAIGN, IL	61820	
PRC	PRENTKE ROMICH COMPANY	8769 TOWNSHIP ROAD 513	SHREVE, OH	44676-9421	
PRS	PROMETHEUS SOFTWARE	5 DEVON STREET			
PSI	PEAL SOFTWARE INC.	1725 PROMENADE, NO. 323	SANTA MONICA, CA	90401	
PWP	PARWANE OARSA	19 FAIRLAND ST.	LEXINGTON, MA	02173	(617)862-4141
QUI	E. DAVID-QUEUE, INC.	5 CHAPEL HILL DRIVE	FAIRFIELD, CT	06432	1(800)232-2224
R&S	RUSHAKOFF & STEINBERG	NEW MEXICO STATE U	LAS CRUCES, NM	88003	
RAH	RANDOM HOUSE-SCHOOL DIVISION	2970 BRANDYWINE ROAD	ATLANTA, GA	30341	(800)638-6460
RAS	RADIO SHACK				

RBI	RICHARD B. INNES	7445 PLYMOUTH ROAD	ANN ARBOR, MI	48105	
RCK	R.C. KURZWEIL	KERZWEIL COMPUTER PRODUCT	SEATTLE, WASHINGTON		
RDC	RAISED DOT COMPUTING	310 S. 7TH STREET	LEWISBURG, PA	12837	
RES	ROBERT E. STEPP III	SATATION A-POB 5002	CHAMPAIGN, IL	61820	(217)359-7933
RMS	ROCKY MOUNTAIN SOFTWARE INC.	214-131 WATER STREET	VANCOUVER, B.C.	V6B 4M3	
ROP	RIGHT ON PROGRAMS				
RRB	ROBERT R. BARKER				
RSI	RESOURCE SOFTWARE INTERN'L	330 NEW BRUNSWICK AVE.	FORDS, NJ	08863	
RSM	RONALD S. MCCUISTON	5795 ADELYN ROAD	PENSACOLA, FL	32504	
RSM	RONALD S. MCCUISTON-MATH DEPT.	PENSACOLA JUNIOR COLLEGE	PENSACOLA, FLORIDA		
RST	R. STEPP	509 E. WHITE #B	CHAMPAIGN, ILLINOIS	61820	
SBT	SUNBURST				
SCL	SCHOLASTIC, WIZWARE	730 BROADWAY	NY, NY	10003	
SCU	SCHNEIER COMMUN. UNIT-CER. PAL	1603 COURT ST.	SYRACUSE, NY		
SEC	STREET ELECTRONICS CORP.	3152 E. LA PALMA, STE. D	ANAHEIM, CA	92806	
SEP	M.W. WATKINS	SOUTHWEST EDPSYCH	POB 1870-PHOENIX, AZ	85001	
SMS	SOUTHERN MICRO SYSTEMS	POB 1981	BURLINGTON, NC	22215	(919)226-7610
SRC	SOFTWARE RESEARCH CORPORATION	DISCOVERY PARK	UNIVERSITY OF VICTORIA___POB 1700		
STS	STERLING SWIFT PUBLISHING CO.	7901 SOUTH IH-35	AUSTIN, TX	78744	
STS	STERLING SOFTWARE	7901 SOUTH IH-35	AUSTIN, TEXAS	78744	
TFS	G.E. RUSHAKOFF	NEW MEXICO UNIVERSITY	LAS CRUCES, NM	88003	
TIE	TIES-MINNESOTA SCHOOL DISTRICT	1925 WEST COUNTY RD. B2	ST. PAUL, MN	55113	(612)633-9110
TJH	T.J. HUSTON	1602 NOBLE FOREST DR.	ATLANTA, GA	30092	(404)448-1523
TKA	TECK ASSOCIATES	POB 8732	WHITE BEAR LAKE, MN	55110	(612)429-5570
TLC	THE LEARNING COMPANY	4370 ALPINE ROAD	PORTOLA VALLEY, CALIFORNIA	94025	
TRA	TETRAHEDRON RESEARCH ASSOC.	3425 VALEJO CT	COLORADO SPRINGS, CO	80918	
TSC	TELEPHONE SOFTWARE CONNECTIONS	POB 6548	TORRANCE, CA	90504	
TWC	T.W. CANNON	3345 ALKIRE WAY	GOLDEN, COLORADO	80401	
TWC	DR. T.W. CANNON	3345 ALKIRE WAY	GOLDEN, CO.	80401	(303)278-7608
TYC	TEACH YOURSELF COMPUTER	40 STUYVESANT MANOR	GENESEO, NY		
UER	UNIVERSE ELECTRIC RESEARCH CO.	339 INNISFAIL DRIVE	ST. LOUIS, MISSOURI	63119	
URM	UPPER ROOM MICROCOMPUTER	907 6TH AVENUE EAST	MENOMONIE, WISCONSON	54751	(715)235-5775
WAW	WALT WOLTOSZ	655 S. FAIR OAKS, M213	SUNNYVALE, CA	94086	(408)733-6358
WCB	W. CREAG BANTA	1500 GORDON TERR.	DEERFIELD, IL	60015	(319)945-8098
WCB	WINNERS CIRCLE EDUCATION CO.	1308 TEMPLE BLDG.	DORCHESTER, NY	14604	(716)325-6493
WMP	WEST MIDLANDS MEP PROJECT	FOUR DWELLINGS SCH. QUINT	BIRMINGHAM, ENGLAND		
WPR	WILLIAM R. PARKS	113 CENTRAL AVENUE	FREDONIA, NY	14063	(716)679-1434

APPENDIX G

EVALUATION SOURCES

APPENDIX G

EVALUATION SOURCES

TITLE	ADDRESS	CITY/STATE	ZIP	PHONE	OTHER
COMPUTER COURSEWARE EVALU	11160 JASPER AVE.	EDMON. ALBERTA	T5K 0L2	403/427-0843	ALBERTA ED. COMP. TECH. PROJECT/83
COURSEWARE IN SPECIAL ED,	10410-121 STREET	EDMONTON, ALB.	T5N 1L2	403/427-2767	FROM ALBERTA ED.-ALSO ON DISKETTE
EDUTECH	7617 LITTLE RIVER TRNPK	ANNANDALE,VA	22003		VARIOUS PUBLICATIONS
HANDICAPPED EDUC. EXCHANG	11523 CHARLTON DRIVE	SIVER SPRING,MD	20902	301/681-7372	COMP. BULLETIN BOARDSYSTEM
RESOURCE MANUAL FOR EXEP.	FLORIDA DEPT. OF ED.	TALLAHASSEE,FL	32301		FDLRS CLEARINGHOU FDLRS CLEARINGHOUSE-KNOTT BLDG.
SOFTWARE REPORTS	2101 LAS PALMAS DR.	CARLSBAD, CA	92008	619/438-8694	
SURVEY OF EXISTING COURSE	256 N. WASHINGTON ST.	FALLS CHURCH,VA	22046		PROJECT TECHMARK-TP AUG. 1983
THE SPECIALWARE DIRECTORY	1875 MORSE RD. STE. 215	COLUMBUS, OHIO	43229		GUIDE TO SOFTWARE SOURCES FOR SP.ED
TRACE CENTER-COMMUNICATIO	1500 HIGHLAND AVENUE	MADISON, WI	53706		314 WAISMAN CENTER-U. OF WISCONSON
TRACE CENTER-REGISTRY	1500 HIGHLAND AVE.	MADISON, WI	53706		314 WAISMAN CENTER-U. OF WISCONSON

APPENDIX H

SPECIAL EDUCATION HARDWARE COMPANIES

SPECIAL EDUCATION HARDWARE COMPANIES

GROUP	COMPANY	ADDRESS	CITY/STATE	ZIP	PHONE	OTHER
BL	SYNTHA-VOICE COMPUTERS	40 ORPHIR RD.	HAMILTON, ONT.	L8K 3Z1	416/578-0565	BRAILLE & TALK TERM.
BL	SYNETIX, INC.	15050 NE 95TH STREET	REDMOND, WA	98052	206/881-7110	SPEECH SYNTH.
BL	EDUTEC INC.	7232 BOONE AVE. NO.	MINNEAPOLIS, MN	55428	612/533-0000	LARGE PRINT DEVICES
BL	AVOS	1485 ENERGY DR.	ST. PAUL, MN	55108	612/646-1515	VOICE SYSTEM
BL	TELESENSORY SYSTEMS, INC.	POB 7455	MOUNTAINVIEW,CA	94039-7455	415/960-0920	
BL	MARYLAND COMPUTER SERV.	2010 ROCK SPRING RD.	FOREST HILL, MD	21050	301/879-3366	BRAILLE&TALKING TER.
BL	DUXBURY SYSTEMS, INC.	77 GREAT ROAD	ACTON, MA	01720	617/263-7761	BRAILLING DEVICES
BL	RAISED DOT COMPUTING	310 S. 7TH STREET	LEWISBURG, PA	17837	717/523-6739	BRAILLING DEVICES
PH	TASH INC.	70 GIBSON DRIVE UNIT 1	MARKHAM, ONT.	L3R 2Z3		SWITCHES,KEYBOARD
PH	ZYGO INDUSTRIES INC.	POB 1008	PORTLAND, OR	97207-1008	503/297-1724	SWITCHES,CTRL INTFC.
PH	PRESTON SOFTWARE LIBRARY	3220 WHARTON WAY	MISSISSAUGA,ONT	L4X 2C1	416/625-5959	
SH	PRENTKE ROMICH COMPANY	8769 TOWNSHIP RD 513	SHREVE, OHIO	44676-9421	216/567-2906	COMMUNICATION DEVICE
SH	BORG-WARNER ED. SYSTEMS	600 WEST UNIVERSITY DR.	ARLINGTON H. IL	60004		VOICE SYNTH.
SH	AUDIOBIONICS	9913 VALLEY VIEW RD	EDEN PRAIRIE,MI	55344	612/941-5464	PERSONAL COMMUNICATO
SH	TASH INC.	70 GIBSON DRIVE-UNIT 1	MARKHAM, ONT.	L3R 2Z3		COMMUNICATION DEV.
SH	INNOCOMP	1121 VEGAS COURT	CHARLOTTESVILLE	VA.,22901	804/296-4805	
SH	PHONIC EAR	7475 KIMBEL ST. UNIT 10	MISSISSAUGA,ONT	L5S 1E7	416/677-3231	
SH	ZYGO INDUSTRIES, INC.	POB 1008	PORTLAND. OR	97207-1008	503/297-1724	COMMUNICATION DEVICE
SH	STREET ELECTRONICS CORP.	1140 MARK AVENUE	CARPINTERIA, CA	93013	805/684-4593	SPEECH SYNTH.
SH	DON JOHNSTON DEV. EQUIP.	981 WINNETKA TERRACE	LAKE ZURICH, IL	60047	312/438-3476	
SH	COMMUNICATION SKILL BUILD	3130 N. DODGE/POB 42050-H	TUCSON, ARIZONA	85733		COMMUNICATION DEVICE

APPENDIX I

INFORMATION SOURCES

INFORMATION SOURCES

GROU	TITLE	ADDRESS	CITY/STATE	ZIP	PHONE	OTHER
ALL	CLOSING THE GAP	ROUTE 2, POB 39	HENDERSON, MN	56004		NEWSPAPER ON COMP. & DIS.
ALL	DR. DOBB'S JOURNAL	1263 EL CAMINO , POB E	MENLO PARK, CA	94025	415/323-3111	JOURNAL
ALL	GUIDE TO INST. MICRO.	BOX 911, 333 MARKET ST.	HARRISBURG, PA	17108	717/783-2528	BOOKLET FROM PENN.D.OF ED
ALL	LEARNING WITH COMPUTER	BOX 185	WEST HILL, ONT.	M1E 4R4		CANADIAN NEWSPAPER
ALL	MICROS IN SPECIAL ED.	901 S. HIGHLAND ST.	ARLINGTON, VA	22204	703/486-0600	SPONSERED BY CEC
ALL	PROJECT EDUTECH	7617 LITTLE RIVER TRPK	ANNANDALE, VA	22003		ANNOT. BIBLIO OF TOPICS
ALL	SCHOOL TECHNEWS	926 J STREET-STE. 212	SACRAMENTO, CA	95814	916/442-0262	JOURNAL
ALL	TECH. AND SPEC. ED.	256 N. WASHINGTON ST	FALLS CHURCH,VA	22046-4549	703/536-2310	
ALL	THE CATALYST	1259 EL CAMINO, SUITE 275	MENLO PARK, CA	94025	415/326-6997	JOURNAL
BL	RAISED DOT COMPUTEING	310 S. 7TH STREET	LEWISBURG, PA	17837	717/523-6739	PUBLISHER'S NEWSLETTER
BL	REHAB NEWSLETTER	1610 26TH ST.	SANTA-MONICA,CA	90404	213/829-6841	VISUALTEK NEWSLETTER
BL	TELESENSORY SYSTEMS INC	POB 7455	MOUNTAINVIEW,CA	94039-7455	415/960-0920	PUBLISHERS NEWSLETTER
PH	ABLEDATA-NAT. REHAB. INFO	4407 EIGHTH ST. NE	WASHINGTON, DC	20017	202/635-5826	PRODUCT DATABASE-REHAB.
PH	ASSOC. OF REHAB. PROG.	4025 CHESTNUT ST. 3RD FL.	PHILADELPHIA,PA	19104		INFO ON DATA PRO. TRAIN.
PH	AUTHOR G.E. RUSHAKOFF	UNIV. OF FLORIDA	GAINSVILLE,FL	32611		PRE. MICRO FOR NON-VOCAL
PH	BIPED CORP.-BUSI. INFOR.	26 PALMER'S HILL ROAD	STAMFORD, CN	06902	203/324-3935	EDUCATIONAL PROGRAM
PH	COPH BULLETIN	101 LINCOLN PARK BLVD.	ROCKFORD, IL	61102		PUBLICATION
PH	COTTING SCHOOL FOR PH.	241 ST. BOTOLPH ST.	BOSTON, MA	02115	617/536-9632	USING LOGO WITH PH STUDEN
PH	CURRENT EXPRESSIONS	8769 TWP.RD. 513	SHREVE. OHIO	44676-9421	216/567-2906	PUBLISHERS NEWSLETTER
PH	HANDICAPPED EDUC. EXCHANG	11523 CHARLTON DR.	SILVER SPRING	MD 20902	301/681-7372	DATA BASE & ELEC. MAIL
PH	I'M HANDICAPPED-JA PRESTO	60 PAGE RD.	CLIFTON, NJ	07012	201/777-2700	PUB. BOOKLET-OVERVIEW
PH	IEEE COMPUTER SOCIETY	POB 80452-WORLDWAY PC	LOS ANGELES, CA	90080		PROCEEDINGS OF JOHN HOPKI
PH	LET'S GET TECHNICAL#1-8	ONE YONGE ST. STE. 2110	TORONTO, ONT.	M5E 1E8		CRCD PUBLICATION
PH	LIFT, INC.	350 PFINGSTEN, SUITE 103	NORTHBROOK, IL	60062	312/564-9004	JOB TRAINING
PH	MICRO. APPLICATIONS PROG.	350 RUMSEY RD.	TORONTO, ONT.	M4G 1R8	416/425-6220	FROM ONT. CRIPPLED CH.CNT
PH	PERSONAL COMP. FOR PHY.D.	10260 BANDLEY DR.	CUPERTINO, CA	95014	408/996-1010	APPLE PUBLICATION
SH	COMMUNICATION OUTLOOK	COMP. SCI.-MICHIGAN ST. U	EAST LANSING, M	48824	517/353-0870	JOURNAL
SH	NASDSE SPECIAL NET	1202 16TH ST.NW-STE.601E	WASHINGTON, DC	20036	202/833-4193	ASSISTIVE DEVICE BULL.BD.
SH	TRACE CENTER-U. OF WISC.	1500 HIGHLAND AVE.	MADISON, WI	53706	608/262-6966	